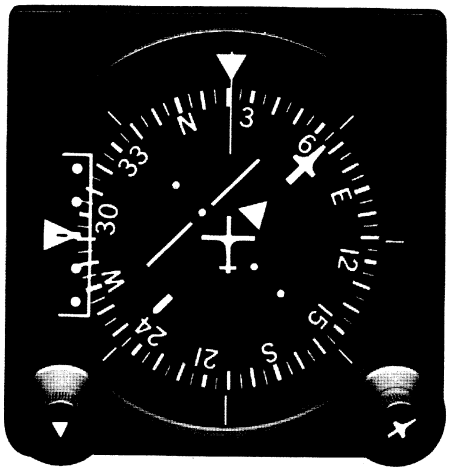
NARCO AVIONICS

SPECTRUM LINE

(Non-TSO'd and TSO'd)

DGO 10



MAINTENANCE MANUAL

NARCO AVIONICS
DIVISION OF NARCO SCIENTIFIC INDUSTRIES
FORT WASHINGTON, PENNSYLVANIA, 19034 U.S.A.

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1.1 GENERAL

There are two models of the DGO 10, a Non-TSO'd model and a TSO'd model.

With both models on the bench one will notice that one model will have the TSO label on the Converter Section whereas one will not. Looking a bit closer one will see that the adjustment holes on the rear of the Converter Section are located differently. One would have to disassemble a Converter Section to see any other differences. Should two Converter Sections be open on the bench, sure identification of which is TSO'd or not is by checking the Chassis Number that is stamped on Board #4. Non-TSO'd Converter Sections have the basic Chassis Number CN208, TSO'd Converter Sections have the basic Chassis Number CNG219.

Converter Sections are interchangeable (TSO'd vs Non-TSO'd) for test purposes.

All Gyro Sections have been and are TSO'd and are labeled accordingly.

This manual will support both models. Where differences between models exist, appropriate notation will be made.

The DGO 10 provides NAV information superimposed on the panel mounted electric directional gyro. This pictorial display of VOR course or Localizer path is with respect to the aircraft's heading. The indicator also has a glide slope needle and warning flag.

The DGO 10 consists of two major sections: the OMNI/LOCALIZER Section, manufactured by NARCO* and the GYRO Section, manufactured for Narco by AIM*.

All non-commercial parts, field service, etc should be referred to the manufacturer of the particular Section.

1.2 CONTENTS

The data contained in Section 4 was supplied by AIM. All other data supplied by NARCO.

1.3 MANUAL ORGANIZATION

This manual is subdivided into four parts: Section 1, INTRODUCTION; Section 2, INSTALLATION; Section 3, OMNI CONVERTER, and Section 4, GYRO. The latter two sections are further subdivided into detail theory and maintenance subsections. Refer to the Table of Contents for specific topics.

*NARCO AVIONICS, Div of Narco Scientific Ind., Commerce Drive, Ft. Washington, Pa. 19034.

AIM, AVIATION INSTRUMENT MANUFACTURING CORP., 9030 Monroe Rd., P.O. Box 12248 Houston, Texas. 77017. A NARCO Company.

1.4 TSO EXPLANATION

The TSO DGO 10 is approved to be instrument panel mounted within the cabin environment of fixed wing aircraft using piston single and multi engines. It is designed for nonpressurized aircraft operating up to 30,000 feet as well as for pressurized aircraft. This equipment requires direct current power but is approved to be installed in aircraft that have additional on board alternating current power sources. The OMNI/LOC Converter is approved to be fuselage mounted within and external to the cabin environment.

There are twelve Environmental Test Procedures established in RTCA Document DO-138. These are identified on the TSO Nameplate. The explanation of Environmental Limits for each of these categories for the TSO DGO 10 are as follows:

DGO 10 Gyro with or without the Converter attached ..... DAMAAAXXXXXX

DGO 10 Converter mounted on a separate base ..... DA $\frac{J}{N}$ AAAXXXXXX

Temperature-Altitude

TSO DGO 10 ..... Ⓓ AMAAAXXXXXX

Temperature Range:

Nonoperating Low -50°C (-58°F)
High +71°C (+160°F)

Up to 30 minutes of operation +65°C (+149°F)

Continuous operation Low -15°C (+5°F)
High +55°C (+131°F)

Altitude: 30,000 Ft. Nonpressurized
15,000 Ft. Pressurized; is not affected by decompression to 40,000 Ft.

Humidity

TSO DGO 10 ..... D Ⓐ MAAAXXXXXX

Standard Humidity for equipment intended for installation in Civil Aircraft.

These units have been tested under the following humidity conditions:

+50°C (+122°F) at 95% RH, reduced to +38°C (+100°F) with humidity maintained as high as possible.

This cycle was repeated twice for a total of 48 hours of exposure. Within 15 minutes* after exposure the units were operated and met all specifications.

*TSO requires that all specifications be met within 4 hours after exposure.

Vibration

TSO DGO 10 Gyro with or without the Converter attached ..... DA (M) AAAXXXXXX

Approved when mounted in the instrument panel of any type of piston single engine or multiengine fixed wing aircraft. The maximum vibration limits are 0.010 inch double amplitude from 5 to 55 Hz with a maximum acceleration of 1.5 G.

TSO DGO 10 Converter mounted on a separate base ..... DA (J/N) AAAXXXXXX

Approved when mounted anywhere within the cabin environment on the fuselage of any fixed or rotary wing, single or multi engine piston or turbine aircraft. Maximum vibration limits:
0.10" double amplitude from 5 to 17 Hz, 1.5G - 17 to 38 Hz,
0.02" double amplitude from 38 to 55 Hz, 3 G constant acceleration 55 to 2000 Hz.

Audio Frequency Magnetic Field Susceptibility*

TSO DGO 10 ..... DAM (A) AAXXXXXX

This equipment is approved for installation in aircraft which have alternating current power sources, including those rated at more than 250 volt amps.

*It is not susceptable to alternating current power source pick-up.

Radio Frequency Susceptibility

TSO DGO 10 ..... DAMA (A) AXXXXXX

This equipment has been tested and is not affected by interference from other on board electronic equipment which meet Category A, Radio Frequency Spurious Emission requirements of the TSO (RTCA Document DO-138).

Radio Frequency Spurious Emission

TSO DGO 10 ..... DAMAA (A) XXXXXX

This equipment has been tested and does not emit RF in excess of that which would interfere with other on board electronic equipment which meet the requirements of Category A, Radio Frequency Susceptibility of the TSO (RTCA Document DO-138).

Other Environmental Conditions

TSO DGO 10 ..... DAMAAA XXXXXX

The letter "X" denotes that recognized installation practices in Civil Aircraft normally do not encounter these Environmental Conditions and are therefore not tested.
These remaining six categories which are shown X'ed from Left to Right refer to:
Explosion .... Waterproofness .... Hydraulic Fluid
Sand and Dust .... Fungus ..... Salt Spray

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FOREWORD

Upon receiving a DGO 10, inspect the shipping container for possible damage to the enclosed unit. The DGO 10 is DOUBLE wrapped and should not be damaged during normal shipment.

GYRO HANDLING*

Gyros are delicate instruments and cannot withstand the shock of being dropped, jarred, or struck by other pieces of equipment.

Gyros should never be removed while they are running or spinning down. A gyro normally operates between 20,000 to 24,000 rpm and takes 10 or more minutes to run down. If a gyro is removed while it is running and if it is tilted more than 90 degrees, it will develop a gimbal lock. The gimbal will tumble and start to spin. If gimbal lock occurs while the gyro is turning, the gimbal may spin fast enough to damage the gimbal bearings.

Even though a gyro has malfunctioned and is being removed from the aircraft, the gyro must be handled with the same respect due a new one. It is easy to think of a gyro that has malfunctioned as one destined for the scrap pile. This is not so. It can probably be fixed. It is therefore very important that proper handling procedures also be employed during removal.

Gyro handling techniques are summarized as follows: (1) Keep the gyro in the original shipping container as long as possible or provide a well padded shock-absorbent container for transporting the gyro (2) Wait at least 10 minutues after removing electrical or vacuum power from the aircraft and/or gyro before removing gyro. Do not remove a gyro while it is running. (3) Lift gyro from the base and carry in an up-right position. (4) Handle the gyro with care at all times and avoid subjecting it to shock or vibration.

SHIPPING

Should it be required that the DGO 10 be shipped to any point for any reason it should be cushion wrapped and double boxed!

SAVE THE ORIGINAL SHIPPING CARTONS.

*Reprinted from the July-August, 1966 issue of Aviation Mechanics Bulletin published by Flight Safety Foundation, Inc.

2.1 UNITS AND ACCESSORIES SUPPLIED

DGO 10, 14v (Non-TSO'd)
with INSTALLATION KIT 03209-0502*
OR

DGO 10, 28v (Non-TSO'd)
with INSTALLATION KIT 03209-0502*
*See page 2-5 for Kit contents.

TSO'd DGO 10, 14v
with INSTALLATION KIT 03209-0502*
OR

TSO'd DGO 10, 28v
with INSTALLATION KIT 03209-0502*
*See page 2-5 for Kit contents.

No licensing is required.

2.1.1 Optional Accessories

a. Kit for the Remote Mounting of the Non-TSO'd DGO 10 OMNI Converter Section, 03209-0501 (See page 2-10 and 2-21 for contents of Kit and installation drawing.)

b. Kit for the Remote Mounting of the TSO'd DGO 10 OMNI Converter Section, 03209-0503 (See pages 2-11 and 2-23 for contents of Kit and installation drawing.)

c. Shielded Cable, NARCO P/N 90091-0001 (A shielded cable is required when the OMNI Converter Section is remotely located, specify cable length when ordering.)

2.2 SPECIFICATIONS

All Gyro Sections since the introduction of the first DGO 10 have been TSO'd and the case of these Sections are so labled.

A TSO'd Converter Section is now available. This manual shall support both Non-TSO'd Models and TSO'd Models. Where differences exist between models, appropriate notation such as: "For Non-TSO'd Models" or "For TSO'd Models" will be made.

Therefore ALL remaining data applies equally to the Non-TSO'd and TSO'd Models.

To further identify Non-TSO'd vs TSO'd Converter Sections a new chassis number has been assigned to the TSO'd Models:
CNG219 relates only to the TSO'd Models
CN208 relates only to the Non-TSO'd Models.

TSO

DGO 10 TSO with integral mounted Omni/Localizer converter or DGO 10 TSO gyro instrument with remote mounted converter.

TSO		ENVIRONMENTAL* CATEGORY	
Gyro	C-5		Type II
Localizer	C-36c	DAMAAAXXXXXX	Class C
Omni	C-40a	DAMAAAXXXXXX	
Glide Slope Indicators	C-34c	DAMAAAXXXXXX	Class C
Remote mounted Omni/Localizer converter			
Localizer	C-36c	DA $\frac{J}{N}$ AAAXXXXXX	Class C
Omni	C-40a	DA $\frac{J}{N}$ AAAXXXXXX	

*See TSO Explanation

GENERAL

Dimensions: 3.38" (8.6 CM) Wide
3.38" (8.6 CM) High

With integral mounted Omni/LOC Converter 10.65" (28.0 CM) long behind Panel

With Omni/LOC Converter remotely mounted 8.15" (20.7 CM) long behind Panel

Remote Mounted Converter 4.30" (10.9 CM) Wide
3.58" (9.1 CM) High
3.12" (7.9 CM) Long

Weight:

DGO 10 with Integral Omni/LOC Converter 4.7 lbs. (2.13 KG)

DGO 10 Gyro without Converter 3.7 lbs. (1.68 KG)

Remote Inverter and Mount 1 lb. (.45 KG)

Electrical:

Omni/LOC	13.75V	.075 amps
	27.5V	.075 amps
Gyro	13.75V	1.5 amps
	27.5V	0.8 amps
Lamps	13.75V	.120 amps
	27.5V	.060 amps

Receiver:

Operates with	NARCO NAV 114 TSO NARCO NAV 100 Most other NARCO Navigation Receivers
Omni Non-TSO'd models:	(Using NARCO NAV 14 or equivalent)
Accuracy	2° under standard conditions
Sensitivity	2.5 μv maximum for full TO or FROM indication
Course Width	10° full scale
Autopilot Output	150μv for standard deflection 1000 ohms load or greater
Omni TSO'd models:	(Using NARCO NAV 114 TSO or equivalent)
Accuracy	1.5° under standard conditions
Sensitivity	2.5μv maximum for full TO or FROM indication
Course Width	10° full scale
Autopilot Output	150μv for standard deflection 1000 ohms load or greater

Localizer Non-TSO'd models:

Accuracy

1.2 dots for standard LOC deflection. With NAV 114 Receiver: 5 microvolts for full flag.

Localizer TSO'd models: (using NARCO NAV 114 TSO or equivalent)

Accuracy	TSO C-36c Class C

Approved Category I or Category II Landings
Aircraft Velocity Stall less than 95 KTS

Approved Category I Landings
Aircraft Velocity Stall greater than 95 KTS

Sensitivity	5μv maximum for full to indication
Deflection	3/5 Full Scale for standard deflection (4 db DDM)
Autopilot Output	90μv for standard deflection 1000 ohms load or greater

Glide Slope Indicator:

Up-Down Resistance 1000 ohms
Up-Down Sensitivity 150 μA full scale

Flag Resistance 1000 ohms
Flag Sensitivity 250 μa for no flag showing

2.3 PRE-INSTALLATION ADJUSTMENTS AND CHECKS

Equipment Required:

a) Signal Generator

b) Power Supply (14 or 28v)

2.3.1 Checks

1. With NO power applied check:
   a) that the L-R needle is centered, ±1 pointer width.
   b) that the TO-FROM (station indication) arrowhead is indicating OFF.
   c) that the Glide Slope Flag is in view.
   d) that the Glide Slope arrowhead is centered, as viewed from a 20 degree downward angle (pilot's line of sight).
   e) that the heading flag is in sight.

Check Gyro voltage and apply 14 or 28 volts

2. Check input current. 14 volt gyro takes about 1.7 amps starting current and after 5 minutes should run around 1.5 amps. Low current (1 amp) may mean that the gyro is not getting up to speed.

3. Check that HDG flag is out of sight.

   NOTE: The DG (heading set) knob and OBS (omni course set knob) must be pushed in to operate. When either is pushed in the gyro is caged and therefore if the unit is turned or the aircraft turns the heading will not change.

   The OBS should only be set with the aircraft straight and level to avoid heading errors. The unit will not be damaged if the OBS is set while at attitudes other than straight and level.

4. With power applied, but no RF signal, check that the L-R needle remains centered ±1 pointer width on both a LOC and OMNI channel.
   NOTE: The undamped output should track closely the internal L-R meter. Connect a standard 1000 ohm 150 microamp meter to pins 4 and 5 and check that the standard meter is centered with no RF signal input. Any large discrepancy between the L-R needle and undamped output, pins 4 and 5, is an indication of trouble in the unit.

5. Check for normal omni and LOC operation.

2.3.2 Adjustments

1. In most installations the zero set pots will be hard to reach after the DGO 10 is installed. It is therefore advisable to set these adjustments before the unit is mounted.
2. There is a foam material between the printed circuit board and the case so that the adjustment pots are not visable. A small slot alignment screwdriver can be inserted through the foam to reach the pots.
3. Set the generator for 500 microvolts for steps 4 to 7.
4. OMNI Zero Set
   The course error should be checked at a few points and the omni zero set at the point that will best average out the errors.
5. OMNI Course Width
   There is no external adjustment for OMNI course width.

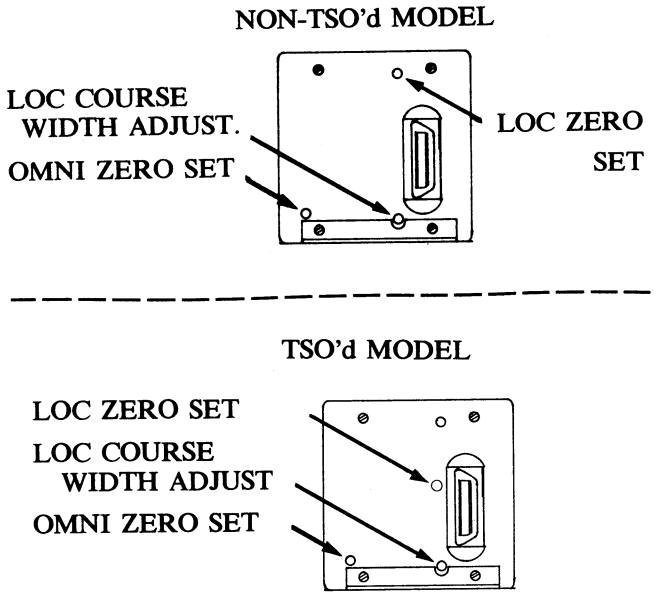


FIGURE 2-1 EXTERNAL ADJUSTMENTS

6. LOC Zero Set
   With a standard centered LOC signal, set for centered needle.

   NOTE: With no RF signal applied, and the receiver set to a localizer frequency, changing the localizer zero control may make a small (typical ±1 pointer width) change in the L-R needle centering.

7. LOC Course Width

   With a standard LOC deviation signal, adjust level control for 1.2 dots deflection starting with pot fully clockwise (which is the minimum deflection). (90 microamps through a 1000 ohm meter connected to the external L-R or undamped output pins 4 and 5.)

   NOTE: LOC Course width adjustment also affects LOC and OMNI flag sensitivity. Set course width **before** checking flag.

2.4 INSTALLATION

2.4.1 Mounting of the Panel Unit

The DGO 10 should be mounted directly in front of the pilot for most convenient use.

NOTE: If the DGO 10 is mounted too far to the right of the pilot the glide slope needle will not be visible, particularly in the full up or down position.

1. Keep away from compass by at least 3".
2. It is recommended that the rear support bracket be utilized to support the unit. The support should complement the installation, that is, if the unit is installed in a shockmounted panel, the rear support would have to be attached to the panel or be similarly shockmounted. If a unit is mounted to a non-shockmounted panel, the panel usually has some flex, a hanger strap would then suffice.
3. Use front panel mounting screws no longer than 1".
4. Apply caution label to instrument panel near the DGO 10

   SET OBS DURING LEVEL FLIGHT ONLY

5. The DGO Gyro Section should be mounted in such a position so that it will be within ±8 degrees of being level, when the aircraft is in level flight.
6. The knobs must be pushed in approximately ¼ inch to set the directional gyro and the OBS. Care should be taken to provide sufficient trim panel clearance so that the knobs can be pushed in all the way.

2.4.2 Split Apart Mounting

The OMNI Converter Section of the DGO 10 can be removed from the back of the current DGO 10's. This Section therefore can be mounted separately if space is not available behind the aircraft panel. An installation with the OMNI Converter Section mounted on the back of the GYRO Section is preferred as this keeps wiring to a minimum.

Refer to EITHER the Split Apart or the Single Unit wiring diagrams. In the Single Unit all leads are carried via the one connector (P401). In the Split Apart Unit the GYRO Section is supplied with separate A+ and glide slope connection to allow this section to operate if the OMNI Converter Section is removed.

2.4.3 DGO 10 Electrical Connections

The DGO 10 is shipped as one unit with the OMNI Converter mounted on the rear of the GYRO. It is recommended that the unit be installed as one unit. In this case all the electrical connections are made to P401.

Where space is limited, the DGO 10 can be easily split apart, allowing the OMNI Converter Section to be removed and remotely located. When the DGO 10 is split apart, a Remote OMNI Converter Mounting Kit is necessary as it contains the intermediary connectors, bracket, and hardware.

When the OMNI Converter Section is removed and remotely mounted refer to the wiring diagrams for specific connections between the OMNI and GYRO Sections. Single conductor shielded wires could be used to connect pins 13, 14, 16, and 17 if the NARCO shielded cable is not available. As these figure show, it is recommended that the GYRO power and glide slope connections be made directly to the GYRO Section connector J101 rather than going thru P401. In this way when the OMNI Converter Section is unplugged, the GYRO will still operate.

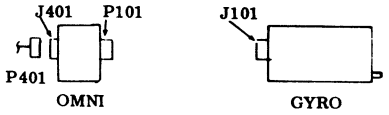
The GYRO Section is not voltage convertable and must be ordered as a 14 or 28v unit. The OMNI Section will accept a 14 or 28v input by proper connections at P401.

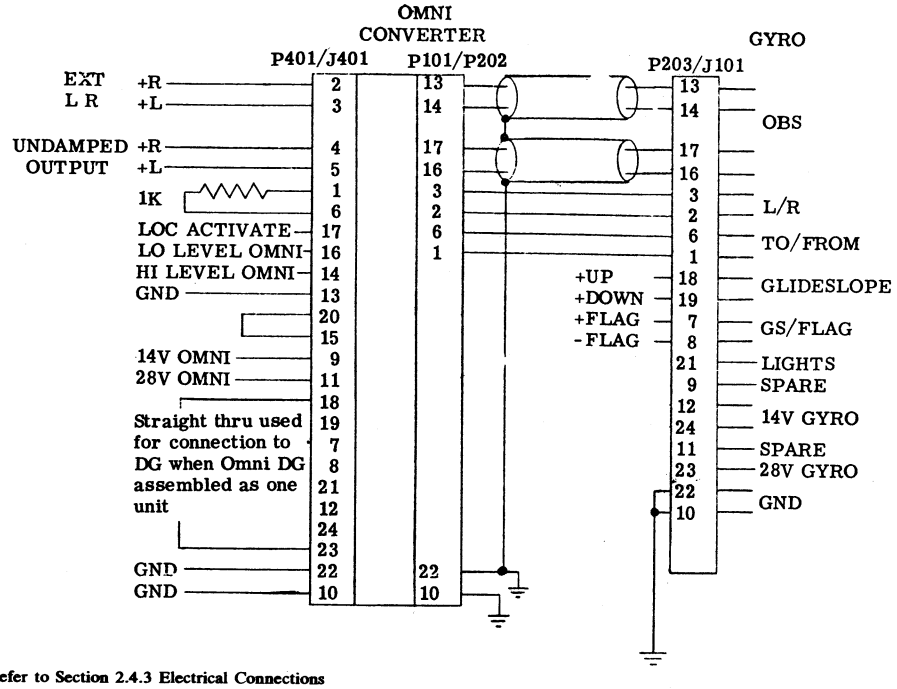
All pin connections are shown in the wiring diagram as well as the simplified functional drawing.

The standard Installation Kit contains the mating connector for J401. Cabling must be provided by the installing agency. It should be noted that the A+ lines be a minimum AWG #22 size.

INSTALLATION KIT
SUPPLIED WITH DGO 10
03209-0502

Part Number	Description	Qty
41285-0004	CONNECTOR (for cable) P401 (Amphenol P/N 57-30240)	1
31192-0102	RESISTOR, FIXED, 1K±10%, ¼w	1
31192-0472	RESISTOR, FIXED, 4.7K ±10%, ¼w	1
04443-0001	LABEL	1





Refer to Section 2.4.3 Electrical Connections

FIGURE 2-2 DGO 10 REMOTE OMNI CONVERTER INTERCONNECT

2.4.3.1 Electrical Connections P401, OMNI Converter Section

Pins 2 and 3, External Left-Right Output

Connected in parallel with the internal L-R meter. Supplies 150 millivolts for FULL SCALE deflection of the internal L-R meter. The internal meter is 1000 ohms - 150 uamps, full scale. An additional standard L-R meter can be connected to pins 2 and 3 (standard L-R meter being 1000 ohm resistance and requiring 150 uamps for full scale deflection).

Pins 4 and 5, Undamped L-R Output

This output has the same voltage output as the external L-R output but is very lightly damped and is electrically isolated from the damped L-R output.

NOTE: Pins 2, 3, 4, and 5 will indicate approximately +5 volts with respect to ground.

Pins 1 and 6, TO-FROM (Station Indicator)

Pins 1 and 6 are connected straight thru to P101 which connects to the Gyro. They connect in parallel with the internal TO-FROM meter. When an external TO-FROM meter is not used, a 1000 ohm resistor MUST be placed between pins 1 and 6. If the 1000 ohm resistor is left out or open, the flag in Localizer mode will show out of the red too early. The flag in OMNI mode will not be affected.

NOTE: The internal TO-FROM meter does not say TO or FROM, in place of the words a white arrowhead (a white solid triangle) is used. When the white arrowhead points toward the OBS orange arrowhead it means TO. When the white arrowhead points to the shaft of the arrow it means FROM.

Pin 17, Localizer Activate

When the NAV receiver is channeled to a Localizer channel, pin 17 is grounded, thereby activating the Localizer circuitry in the OMNI Converter Section.

NOTE: If a glide slope receiver other than a NARCO UGR-2 or UGR-2A is used and the localizer activate is connected to the glide slope activate a diode must be connected in series with the glide slope activate unless the glide slope has an internal diode. The diode is needed to prevent a sneak path locking the DGO 10 in LOC mode.

Pins 10, 13, and 22, Grounds

Pin 13 and pin 10 are connected internally. Pin 22 runs direct from J401 and P101 to supply grounds to the gyro power supply. Pin 10 connects to the OMNI Boards and to the gyro power supply. Pins 10 and 22 should be connected to an airframe ground. Pin 13 should be connected to an airframe ground or to the radio's signal ground, if available.

Pin 16, Low Level NAV Signal Input

Pin 16 is the connection point for inputs from such NAV receivers found in NARCO's Executive, TSO'd Spectrum, and the Spectrum Lines, as well as the Mark 16 and the Mark 24.

.3 v rms of 30 Hertz measured with 9960 signal removed.

.1 to .3 volts of 9960 Hertz measured with 30 Hertz signal removed.

Pin 14, High Level NAV Signal Input

Pin 14 is the connection point for inputs from such NAV receivers as NARCO's Mark 12, Mark 12A, or the Mark 12B.

3 v rms of 30 Hertz only.
1 to 3 volts of 9960 Hertz only.

Pins 15 and 20

LOW LEVEL
Install a jumper between pins 15 and 20 when the NAV Signal Input is Low Level.

HIGH LEVEL
Install a resistor (4.7K) between pins 15 and 20 when the NAV Signal is High Level.

(The value of the resistor may be changed if there is not enough range on the OMNI Zero Set pot.)

NOTE: No connections are required in TSO'd Models, however it is recommended that either the jumper or the resistor be installed between pins 15 and 20 in ALL installations. With such interconnections, should the TSO'd model become inoperative, either model could be temporarily installed. Of course the use of a Non-TSO'd unit in a TSO installation voids the TSO certification while the Non-TSO'd model is installed.

Pins 7/8 and 18/19, Glide Slope Connections (They run straight thru to P101.)

Pins 7 and 8 are for a standard 250 μamp, 1000 ohm flag.

Pins 18 and 19 are for standard 1000 ohm, 150 amp for full scale deflection meter.

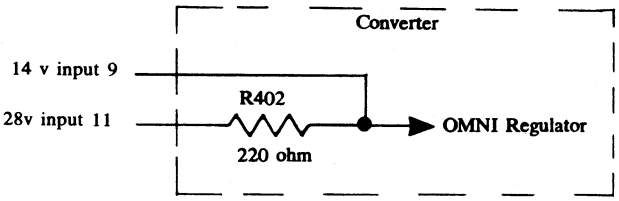
Pin 21, Internal Lighting

Pin 21 is the A+ connection for either 14 or 28 volt internal lighting.

Pins 9, 11, 12, 23, and 24, Power

The OMNI Converter Section in the 14 or 28 volt units are identical in every respect and therefore are interchangeable.

Pin 9 — 14 volts to OMNI
Pin 11 — 28 volts to OMNI



NOTE: In 14 and 28 volt units both pins 9 and 11 will have voltage on them because of R402 in the OMNI Converter. Therefore, in 14 volt units, pin 11 MUST be left blank, and in 28 volt units, pin 9 MUST be left blank.

The 14 and 28 volt gyros have different power supplies and are not convertible.

Pin 12 and 24 which run direct to P101 are for 14 volt gyro input. 28 volt units are supplied with pins 12 and 24 not connected in the gyro assembly.

Pin 23, which runs direct to P101 is the 28 volt input to the gyro. 14 volt units are supplied with pin 23 not connected in the gyro assembly.

	14v OMNI	14v GYRO	28v OMNI	28v GYRO
Current Required	.075 amp	1.5 amp	.075 amp	.8 amp
Breaker Recommended	Tied to NAV Receiver	3 amp	Tied to NAV Receiver	2 amp

NOTE: The Gyro is a primary flight instrument and should always get its power through its own circuit breaker used for nothing else.

IMPORTANT NOTE:

THE DGO IS A PRIMARY FLIGHT INSTRUMENT. IT SHOULD ALWAYS GET ITS POWER THROUGH ITS OWN CIRCUIT BREAKER USED FOR NOTHING ELSE!

In some NAV/COM systems, such as MK16, a 28 to 14 volt converter is used when the radio is installed in a 28 volt aircraft. In a 28 volt aircraft a 28 volt DGO 10 should always be used and the gyro connected directly to the bus. Never use a 14 volt DGO 10 connected to the 28 to 14 volt converter.

If necessary the 14 volt omni input, pin 9, of the DGO 10 may be used in 28 volt DGO's and connected to the 14 volts from the 28 to 14 volt converter.

In most 28 volt systems the switched A+ at the omni cable will be 28 volts. This is connected to pin 11, 28 volt omni in. There will be a few systems where the 28 volt to 14 volt converter runs all the time and the switched A+ is 14 volts.

Check the system carefully before installing.

2.4.4 Installation of the Remote Mounted OMNI Converter Section

All DGO 10's are shipped from NARCO with the OMNI Converter Section mounted to the GYRO Section of the instrument.

This section describes the removal and remote mounting of the OMNI Converter Section of the DGO 10. Refer to the exploded view drawing for complete part orientation.

1. Obtain Installation Kit (Non-TSO'd or TSO'd) See Section 2.1.1.
2. Remove the cover from the OMNI Converter Section, complete with the rubber gasket, by unscrewing the four corner screws (2 long and 2 short) from the rear of the cover. The rear mounting support will fall off. Save all 4 screws and the mounting support.
   NOTE: It is recommended that to keep the PC boards and the support-spacer rods together and in proper orientation, slip a rubber band around this section before removing it from the GYRO Section.
3. Remove the OMNI Converter by unscrewing the two hex rods, this action should also disengage P101 from J101. Use care in handling the OMNI boards while it is uncased so as not to move the alignment pots that are exposed.
4. Five screws are required to secure the cover to the GYRO Section. One screw, centrally located in the back of the cover, is already installed. Take four, #4-40 screws with captive lockwashers from the Kit and the previously removed rear mounting support and install them in the back of the GYRO Section cover. The mounting support should be positioned as it was when it was mounted on the rear of the OMNI Converter cover.
5. Take connector P202 from the Kit and remove the wire locking fingers. Take these fingers and install them on connector J101 on the rear of the GYRO Section.
6. The GYRO Section may now be installed in the aircraft panel.
7. Secure the mounting plate to the OMNI Converter using the two hex threaded rods.
8. Place the cover, complete with the rubber gasket, over the OMNI Converter and fasten the cover to the assembly using the previously removed corner screws (2 long and 2 short).

   (TSO Kits include an additional mounting support. Mount it in the same manner that the original support was mounted.)
9. Determine location for mounting the OMNI Converter Section (bulkhead, deck, or overhead) and lay out the cable as shown in the interconnect diagram.
10. Disassemble connector P202.
11. Make ALL connections (P202, P203, etc) as shown in the interconnect diagram.
12. Reassemble and mount connector P202 using the #3-48 screws and the spacers supplied in the Kit. (The screws that are actually packaged with the connector may be discarded, however use the nuts.) The proper part orientation is shown in the exploded view.
13. Connect P101 to P202. Secure the Mounting Plate to the Mounting Bracket with the four remaining #4-40 screws.

    (TSO Kits include a #6-32 screw and lockwasher. Use this hardware to secure the new mounting support to the Mounting Bracket.)
14. The Mounting Bracket should be secured to the airframe using #6-32 hardware.

2.4.5 Post Installation

1. Was the CAUTION Label applied to the panel?

SET OBS DURING LEVEL FLIGHT ONLY

2. With NO power applied check:
   a) that the L-R needle is centered, ±1 pointer width.
   b) that the TO-FROM (station indication) arrowhead is indicating OFF.
   c) that the Glide Slope Flag is in view.
   d) that the Glide Slope arrowhead is centered, as viewed from a 20 degree downward angle (pilot's line of sight).
   e) that the heading flag is in sight.

TURN ON

3. 14 volt gyro takes about 5 minutes to set up to speed.
4. Check that HDG flag is out of sight.

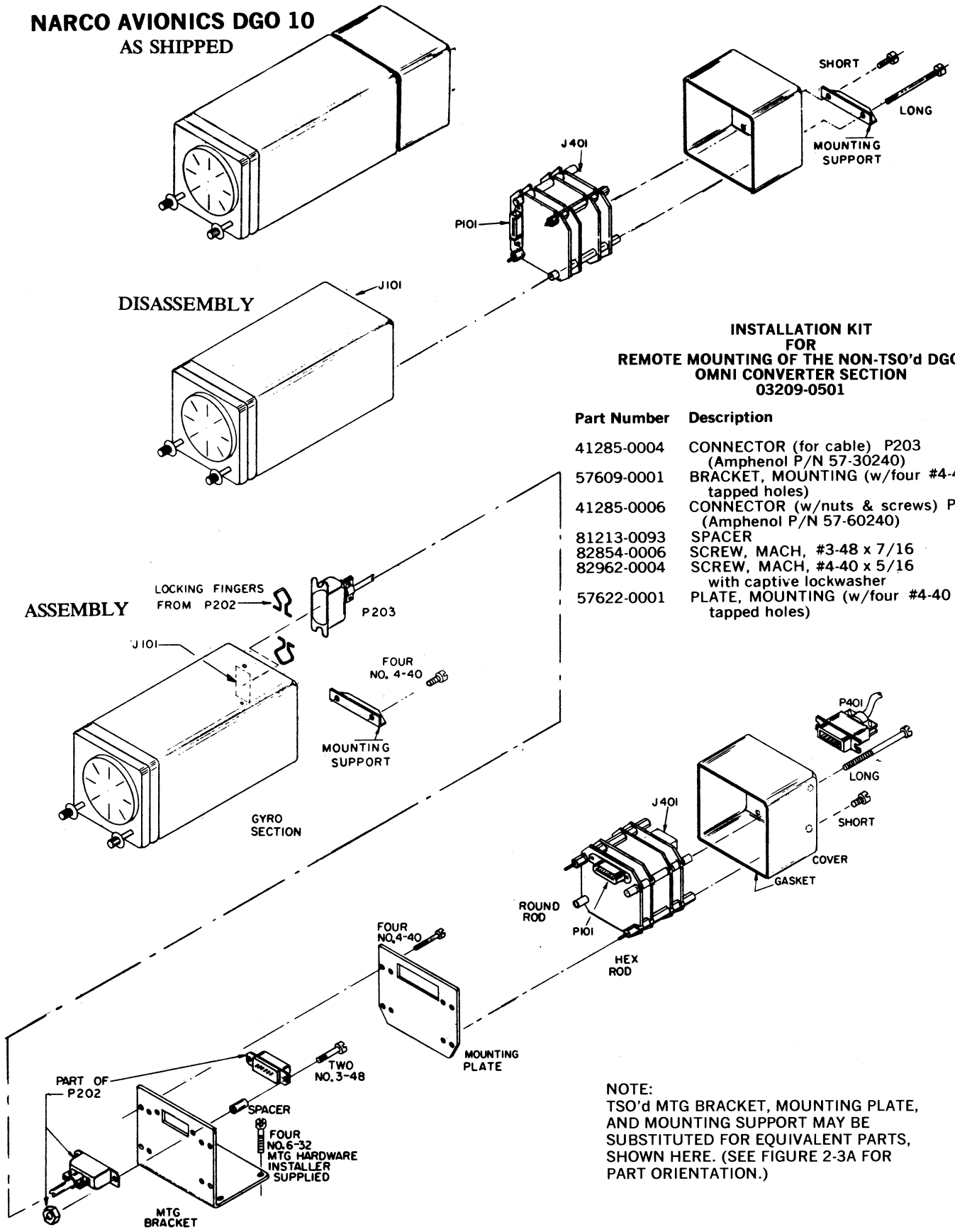
NOTE: The DG (heading set) knob and OBS (omni course set knob) must be pushed in to operate. When either is pushed in the gyro is caged and therefore if the unit is turned or the aircraft turns the heading will not change.

The OBS should only be set with the aircraft straight and level to avoid heading errors. The unit will not be damaged if the OBS is set while at attitudes other than straight and level.

5. With power applied, but no RF signal, check that the L-R needle remains centered ±1 pointer width on both a LOC and OMNI channel.
6. It is recommended that OMNI and LOC operation be checked during a flight check.

2.5 OPERATION

Complete data is contained in the pilot's guide entitled "Flying the picture with DGO 10" by Narco.

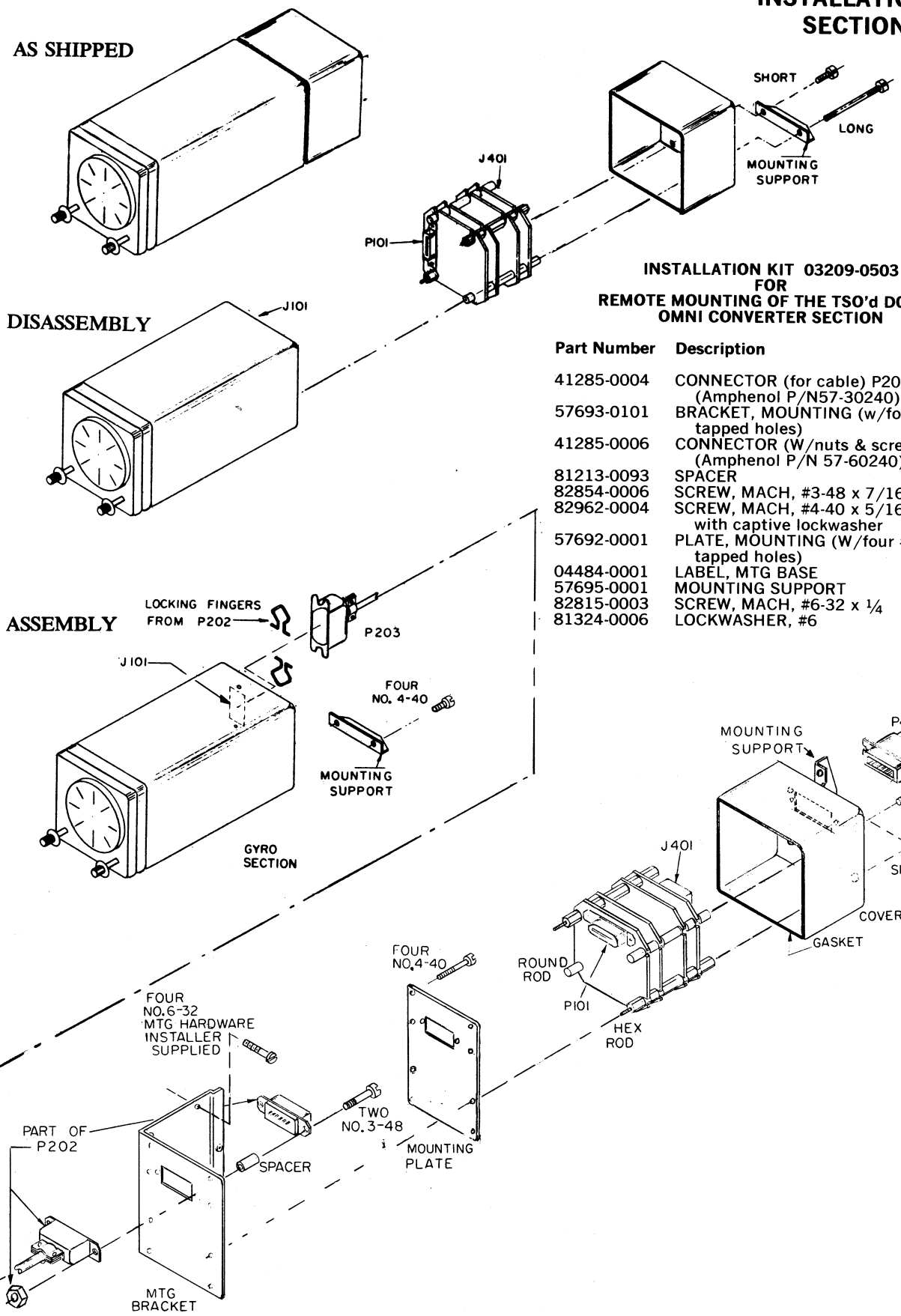


INSTALLATION KIT
FOR
REMOTE MOUNTING OF THE NON-TSO'd DGO 10
OMNI CONVERTER SECTION
03209-0501

Part Number	Description	Qty
41285-0004	CONNECTOR (for cable) P203 (Amphenol P/N 57-30240)	1
57609-0001	BRACKET, MOUNTING (w/four #4-40 tapped holes)	1
41285-0006	CONNECTOR (w/nuts & screws) P202 (Amphenol P/N 57-60240)	1
81213-0093	SPACER	2
82854-0006	SCREW, MACH, #3-48 x 7/16	2
82962-0004	SCREW, MACH, #4-40 x 5/16 with captive lockwasher	8
57622-0001	PLATE, MOUNTING (w/four #4-40 tapped holes)	1

NOTE:
TSO'd MTG BRACKET, MOUNTING PLATE, AND MOUNTING SUPPORT MAY BE SUBSTITUTED FOR EQUIVALENT PARTS, SHOWN HERE. (SEE FIGURE 2-3A FOR PART ORIENTATION.)

FIGURE 2-3 EXPLODED VIEW SHOWING THE NON-TSO'd DGO 10 AND THE REMOTE MOUNTING OF THE OMNI CONVERTER SECTION



INSTALLATION KIT 03209-0503
FOR
REMOTE MOUNTING OF THE TSO'd DGO 10
OMNI CONVERTER SECTION

Part Number	Description	Qty
41285-0004	CONNECTOR (for cable) P203 (Amphenol P/N57-30240)	1
57693-0101	BRACKET, MOUNTING (w/four #4-40 tapped holes)	1
41285-0006	CONNECTOR (W/nuts & screws) P202 (Amphenol P/N 57-60240)	1
81213-0093	SPACER	2
82854-0006	SCREW, MACH, #3-48 x 7/16	2
82962-0004	SCREW, MACH, #4-40 x 5/16 with captive lockwasher	8
57692-0001	PLATE, MOUNTING (W/four #4-40 tapped holes)	1
04484-0001	LABEL, MTG BASE	1
57695-0001	MOUNTING SUPPORT	1
82815-0003	SCREW, MACH, #6-32 x 1/4	1
81324-0006	LOCKWASHER, #6	1

FIGURE 2-3A EXPLODED VIEW SHOWING THE TSO'd DGO 10 AND THE REMOTE MOUNTING OF THE OMNI CONVERTER SECTION

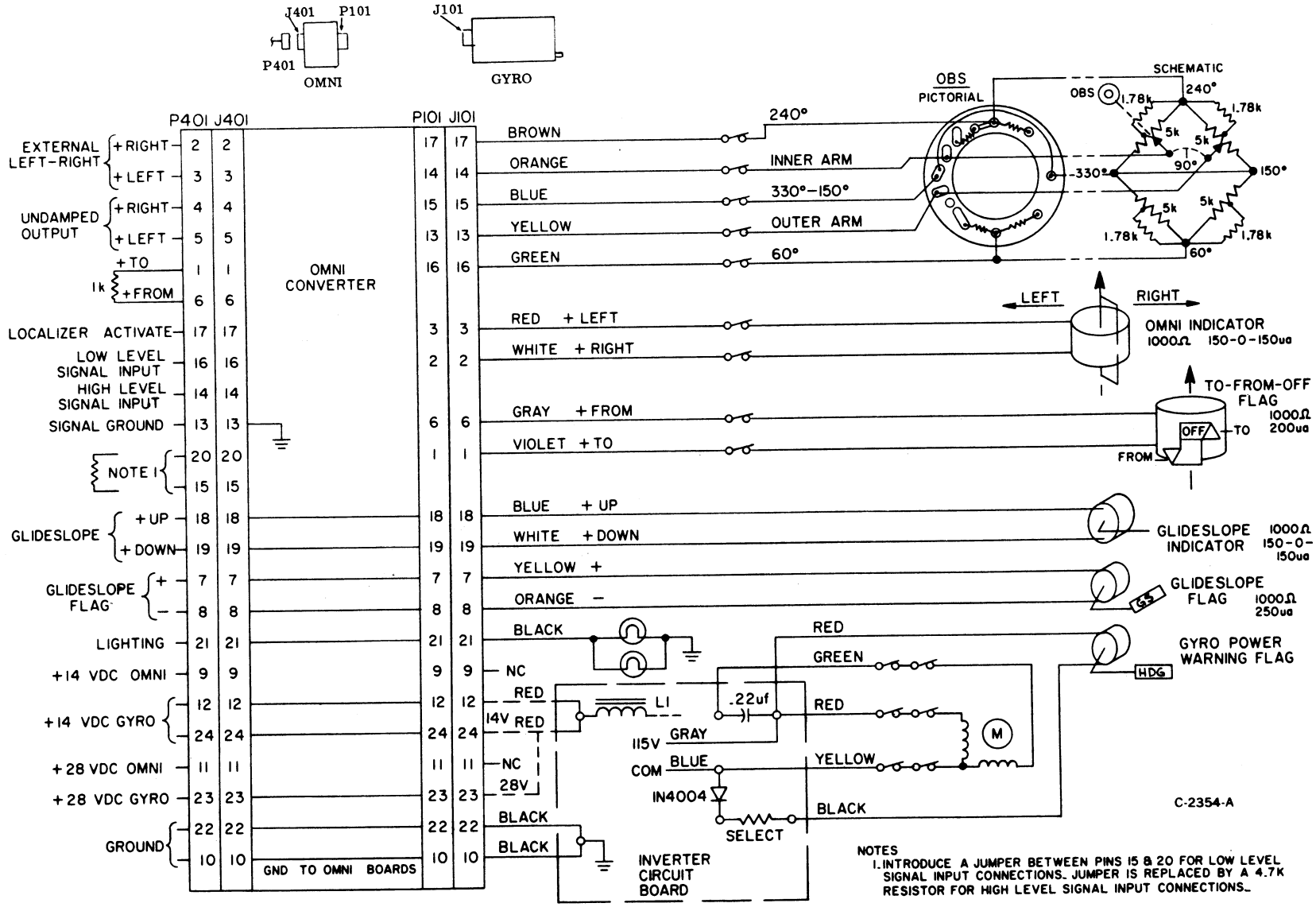


FIGURE 2-4 DGO 10 WIRING AND FUNCTIONAL DIAGRAM

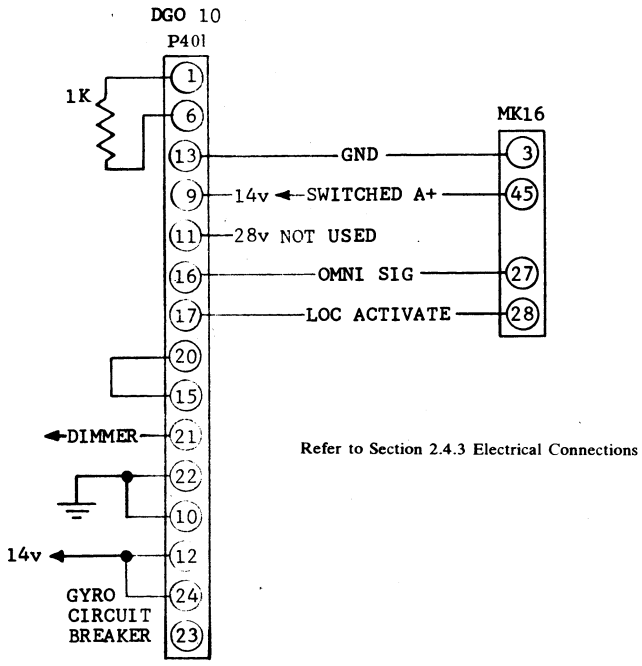


FIGURE 2-5 14V DGO 10/MARK 16 WIRING (Single Unit)

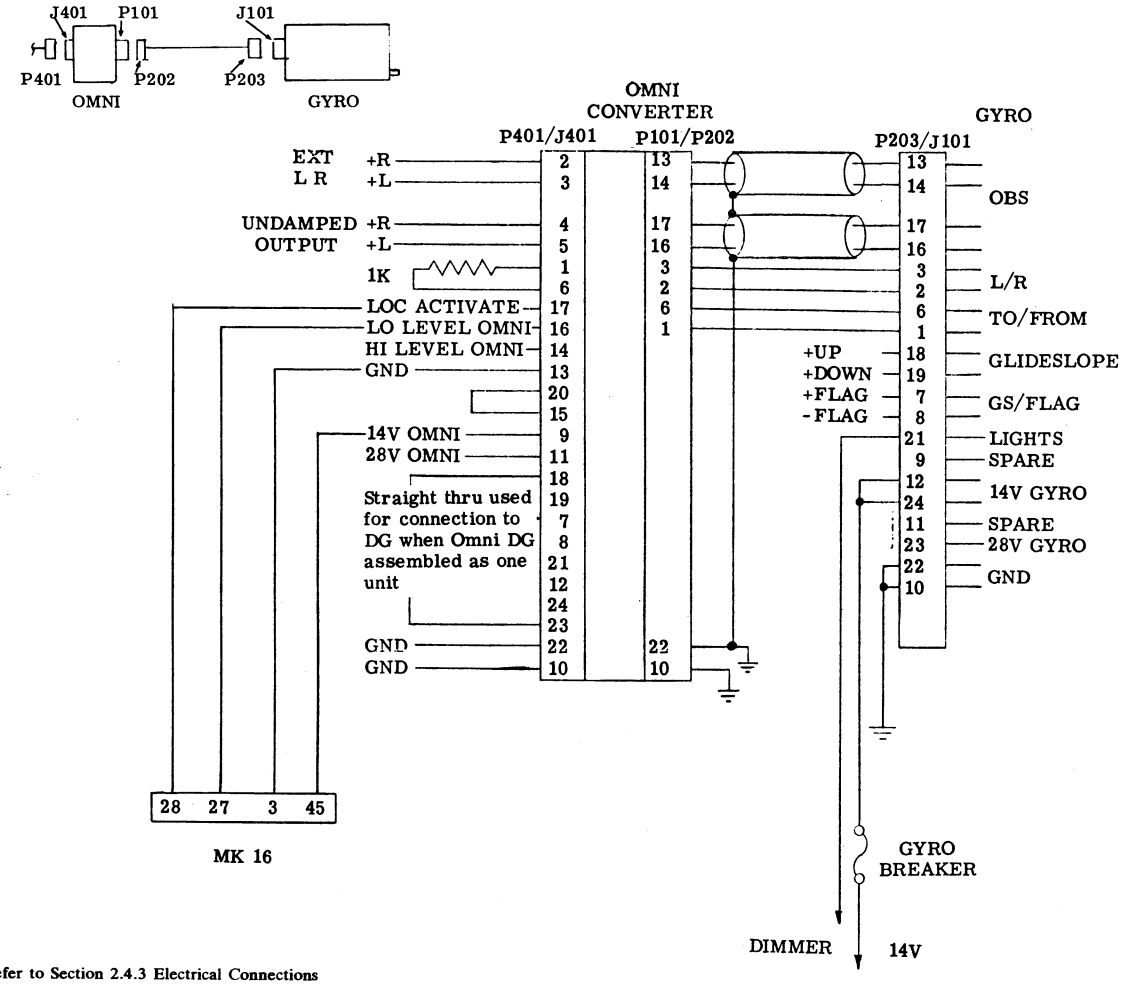


FIGURE 2-6 14V DGO 10/MARK 16 WIRING (Split Apart)

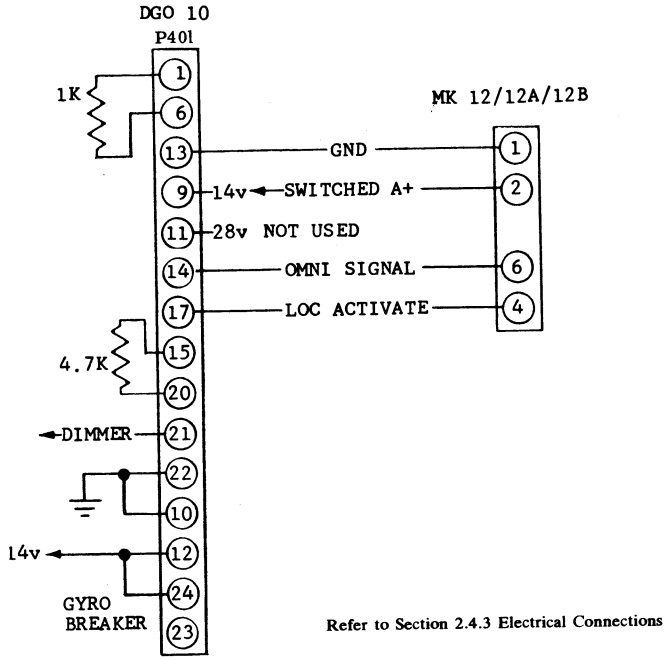


FIGURE 2-7 14V DGO 10/MARK 12/12A/12B WIRING (Single Unit)

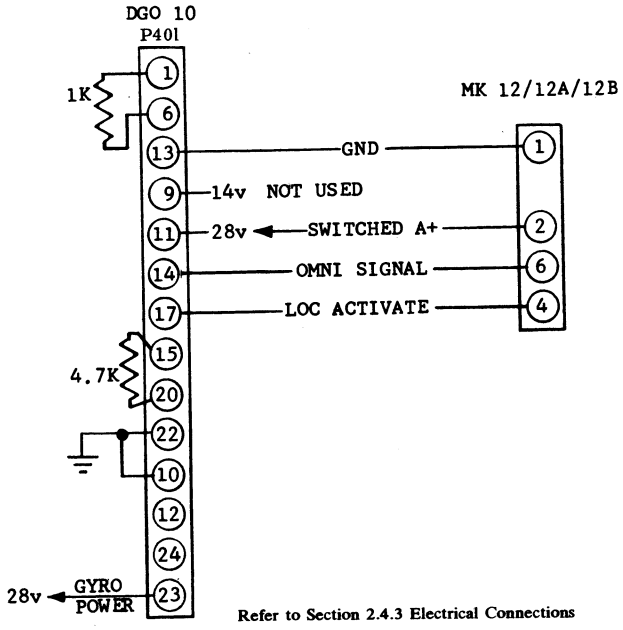


FIGURE 2-8 28V DGO 10/MARK 12/12A/12B WIRING (Single Unit)

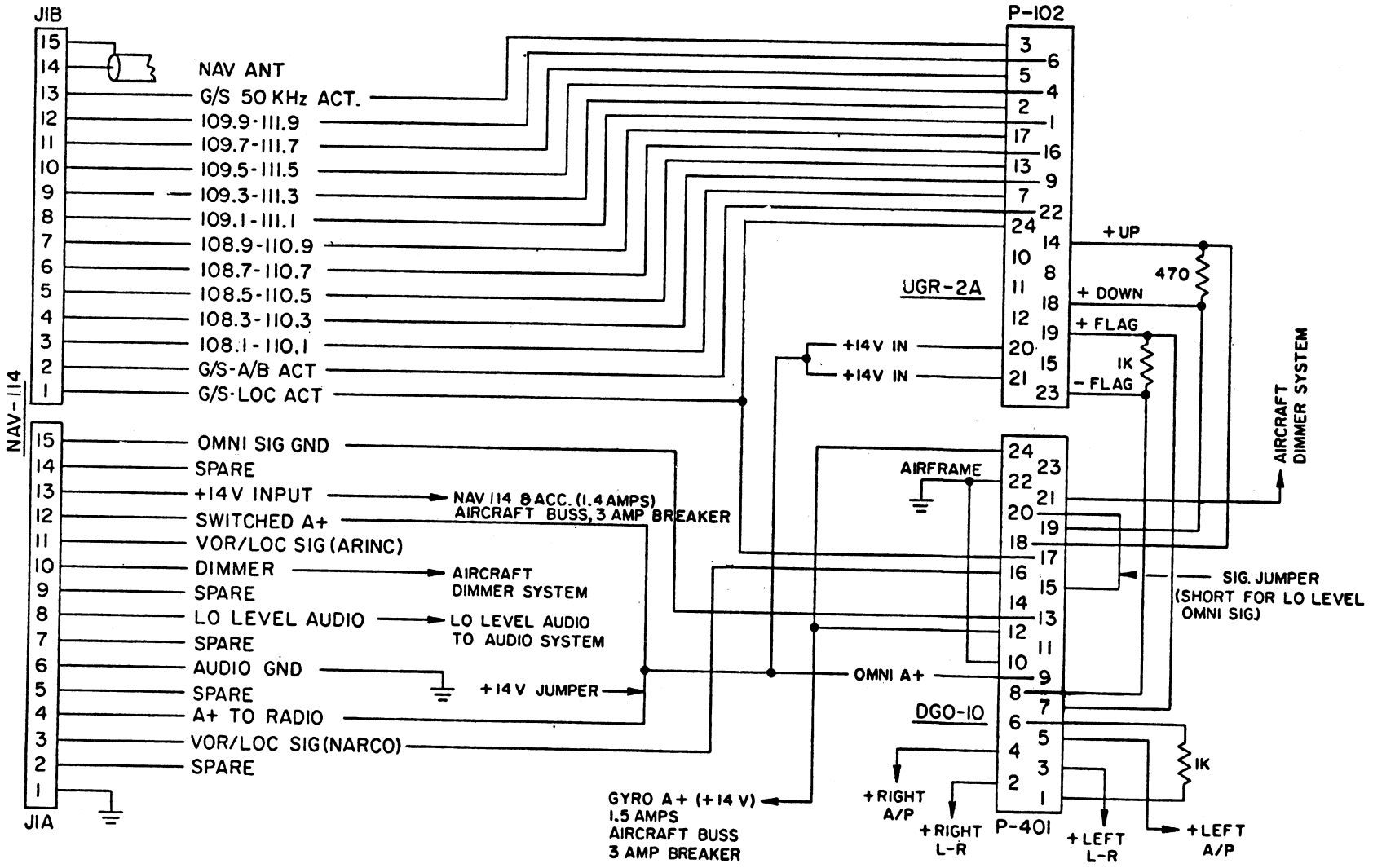


FIGURE 2-9 14V DGO 10/UGR-2A/NAV 114 TSO WIRING (Single Unit)

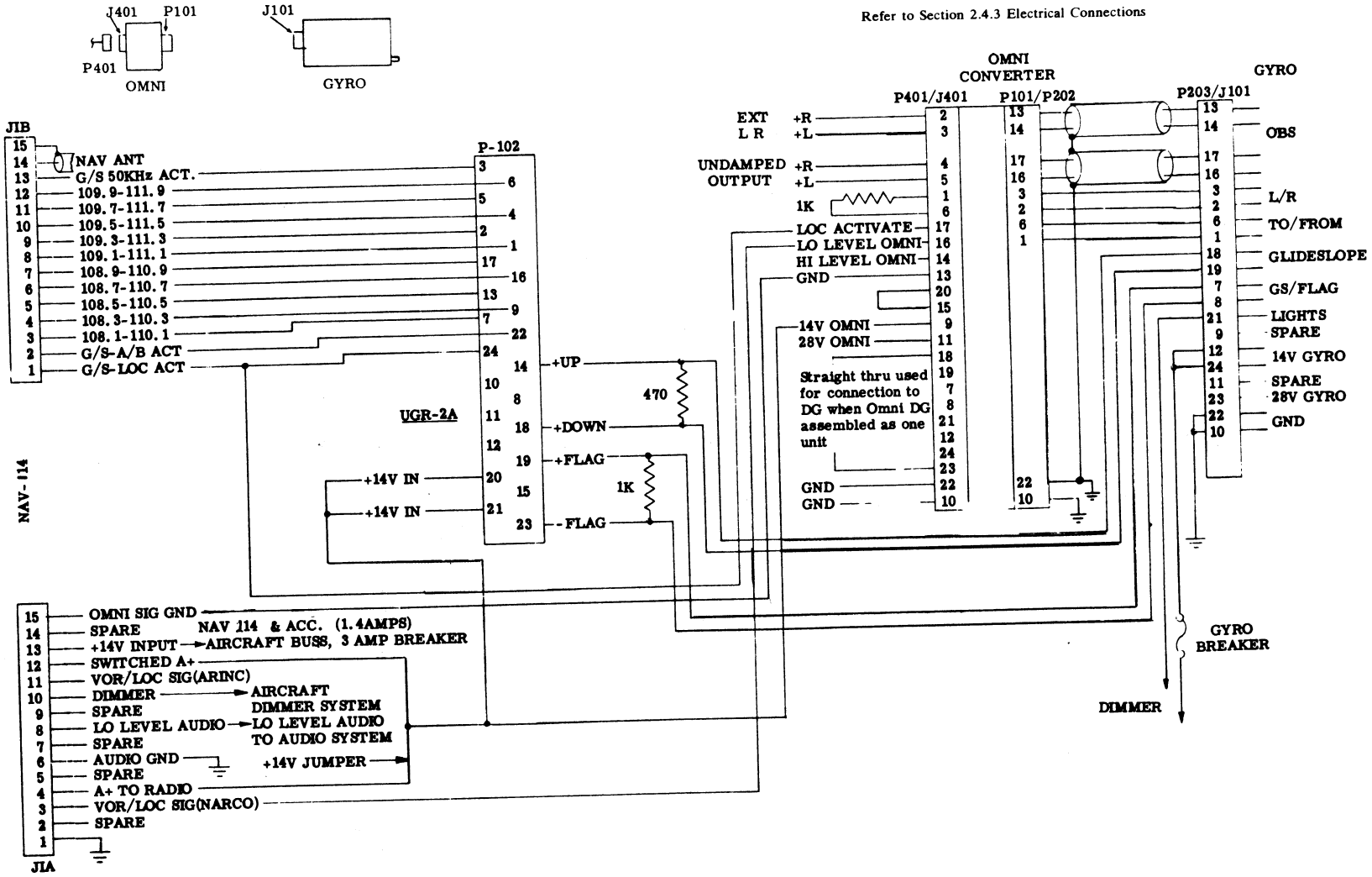


FIGURE 2-10 14V DGO 10/UGR-2A/NAV 114 WIRING (Split Apart)

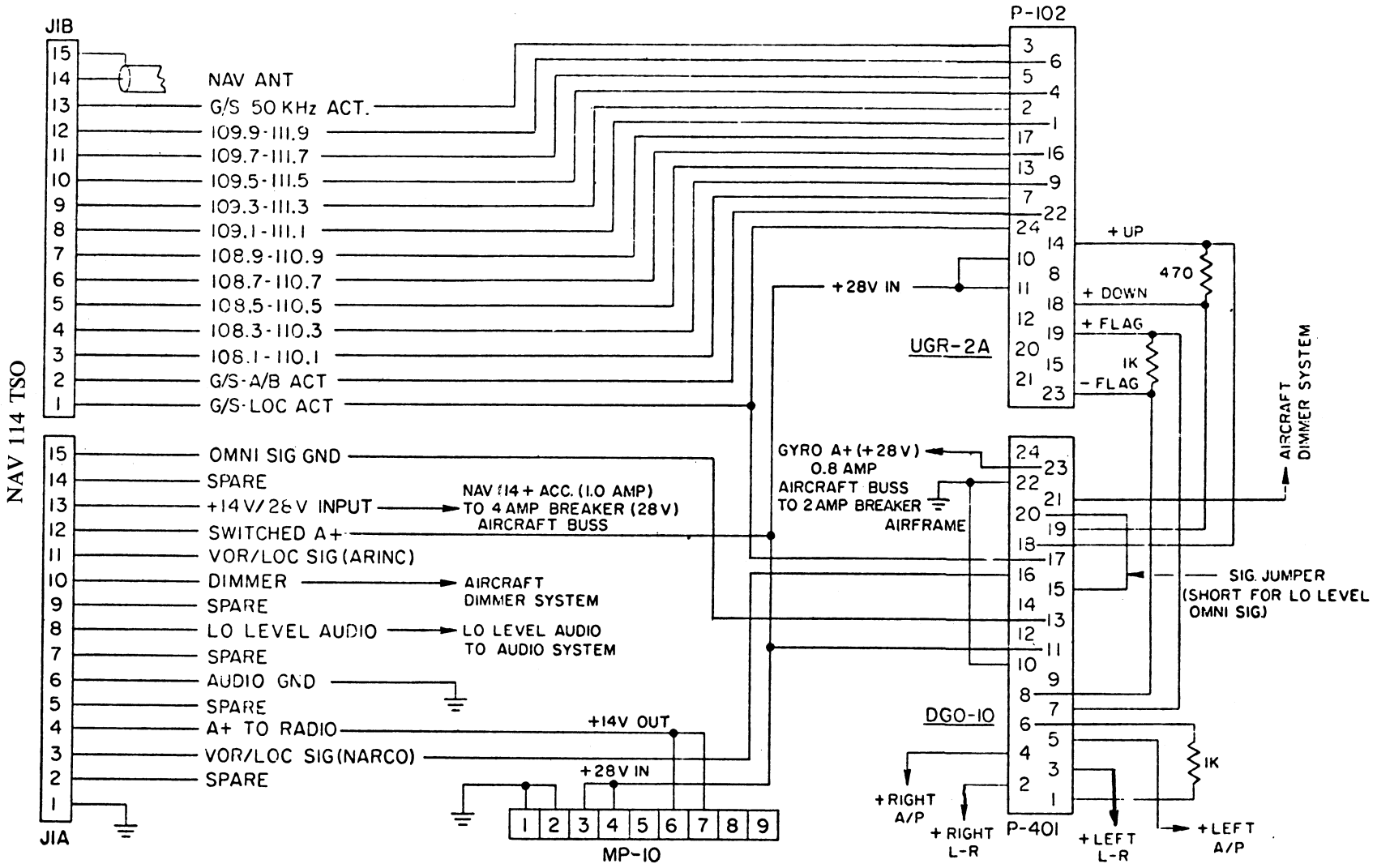


FIGURE 2-11 28V DGO 10/UGR 2A/MP 10/NAV 114 WIRING (Single Unit)

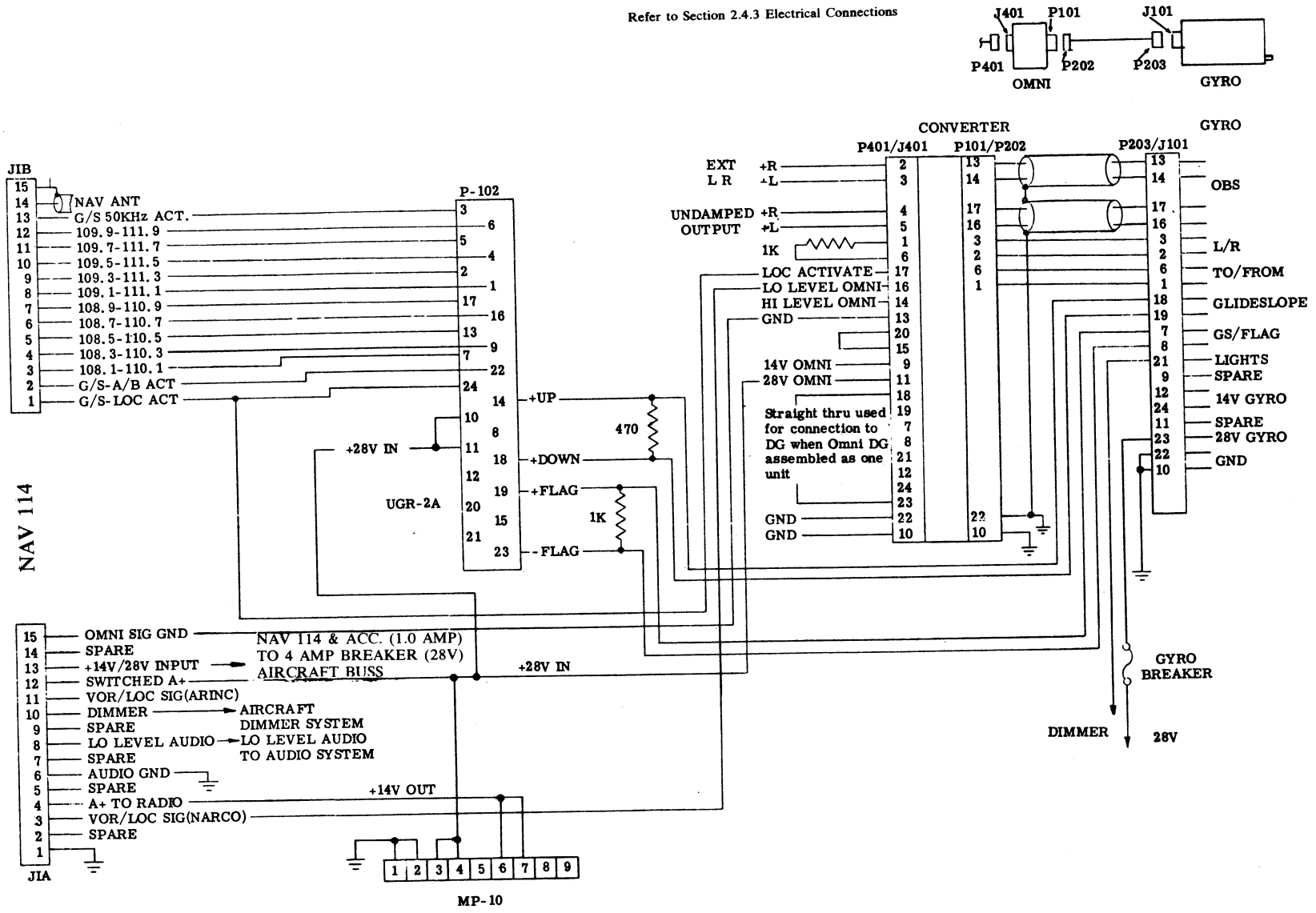
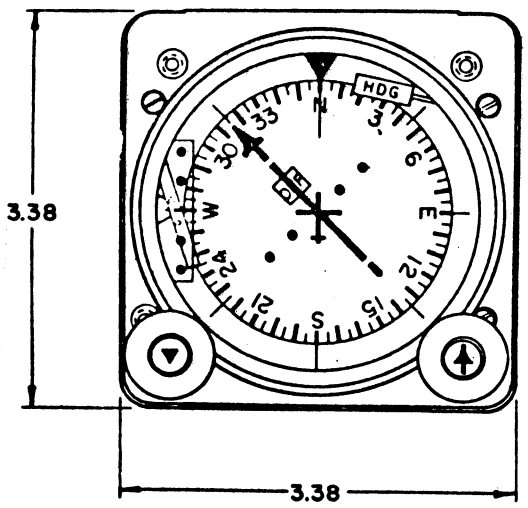
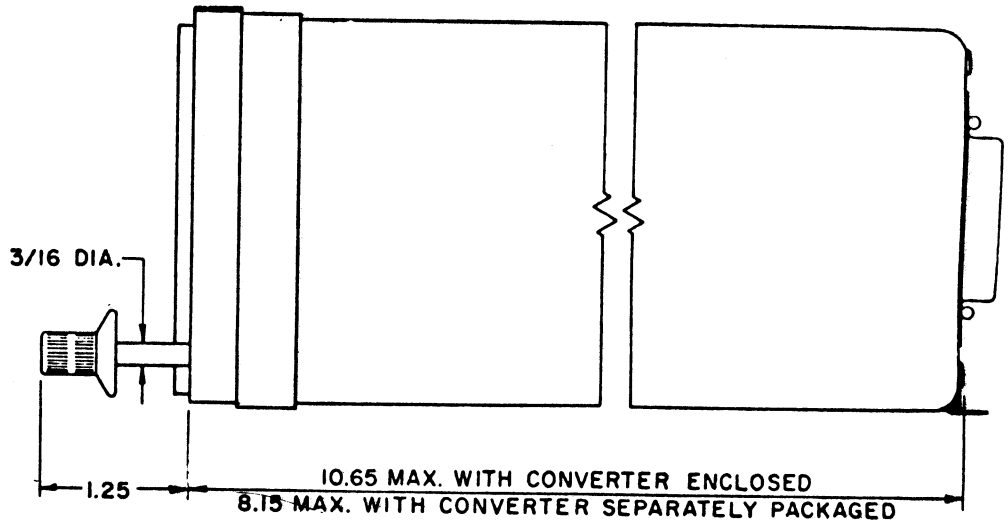


FIGURE 2-12 28V DGO 10/UGR 2A/MP 10/NAV 114 WIRING (Split Apart)





WEIGHTS:

COMBINED UNIT.....4.7 lb

SPLIT APART :

GYRO SECTION.....3 lb, 12 oz.
OMNI SECTION.....10.5 oz.
REMOTE KIT, less cable 6 oz.

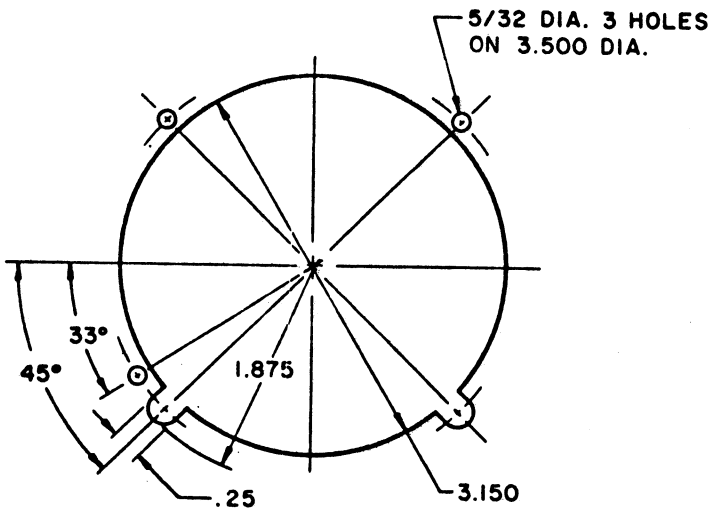
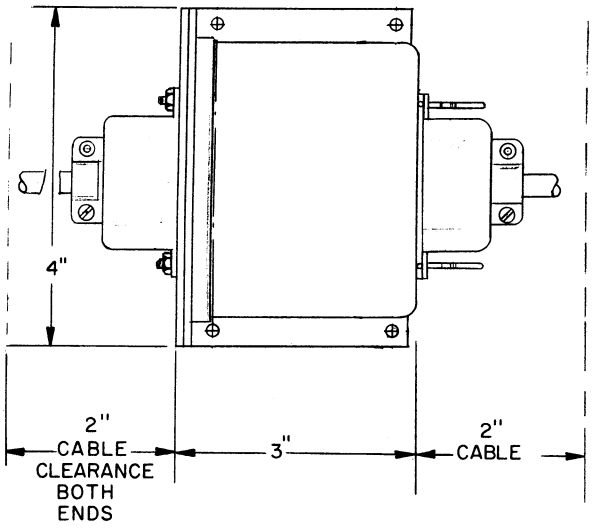
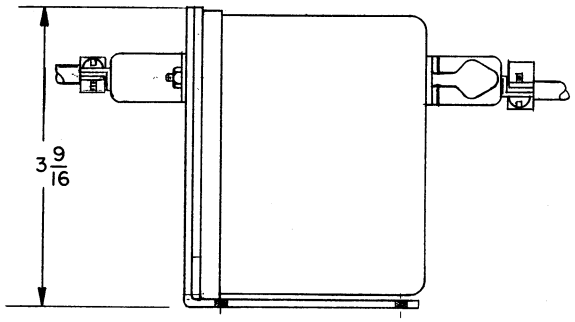


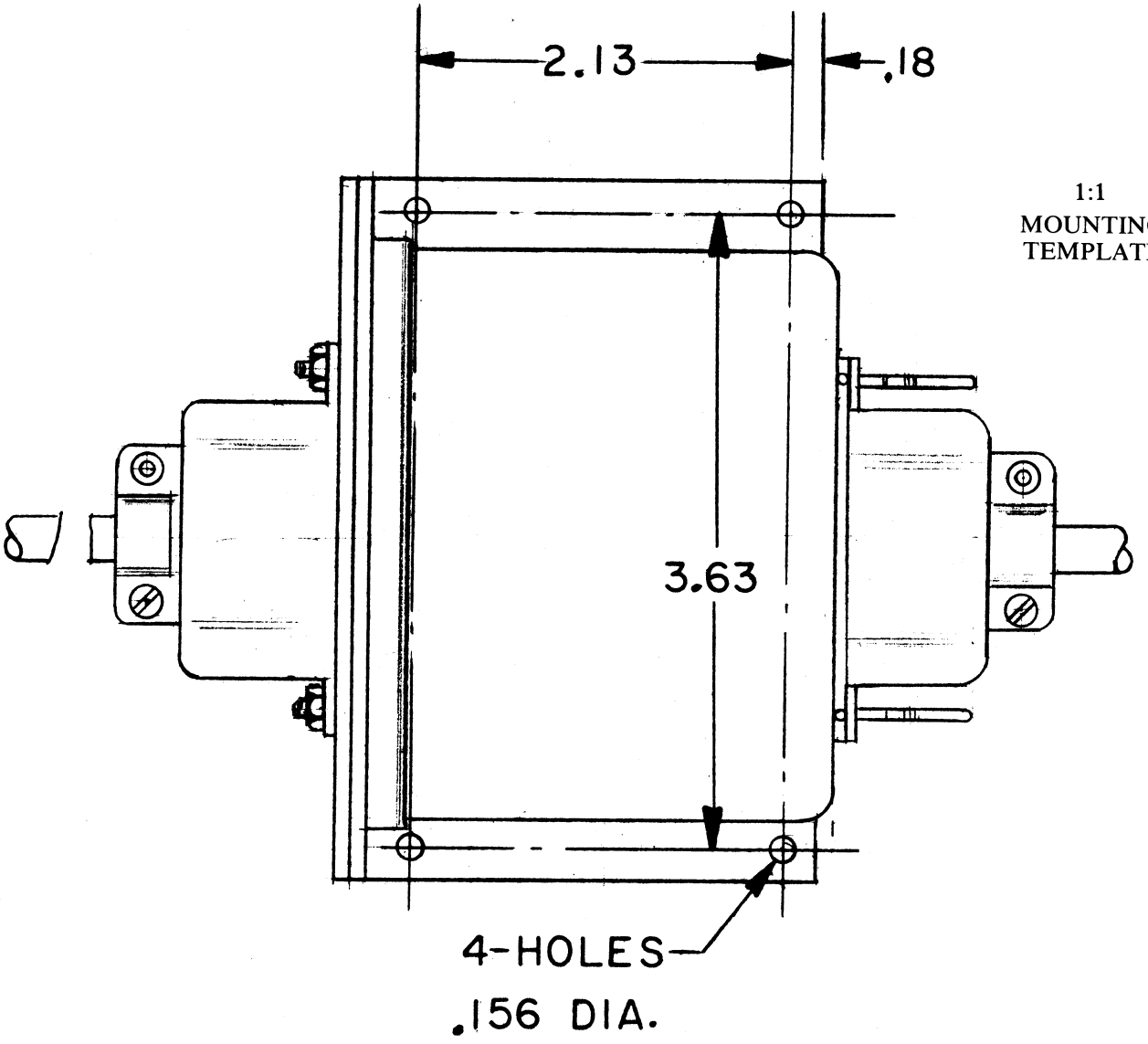
FIGURE 2-13 DGO 10 OUTLINE DIMENSIONS



TOP VIEW

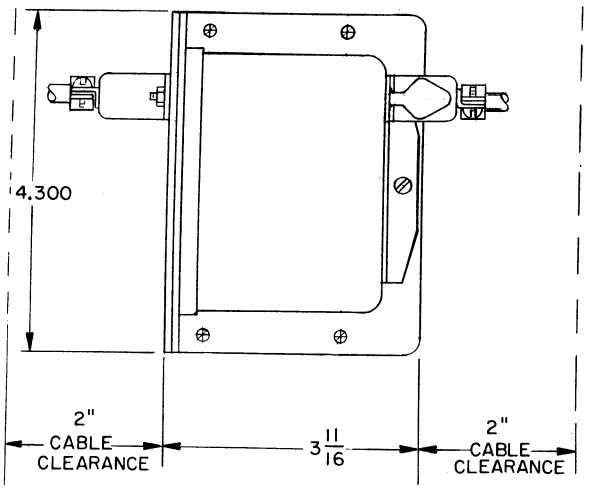


SIDE VIEW

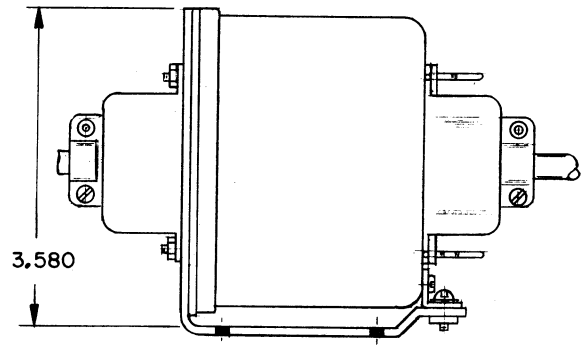


1:1
MOUNTING
TEMPLATE

FIGURE 2-14. DGO 10 NON-TSO'd REMOTE CONVERTER MOUNTING



TOP VIEW



SIDE VIEW

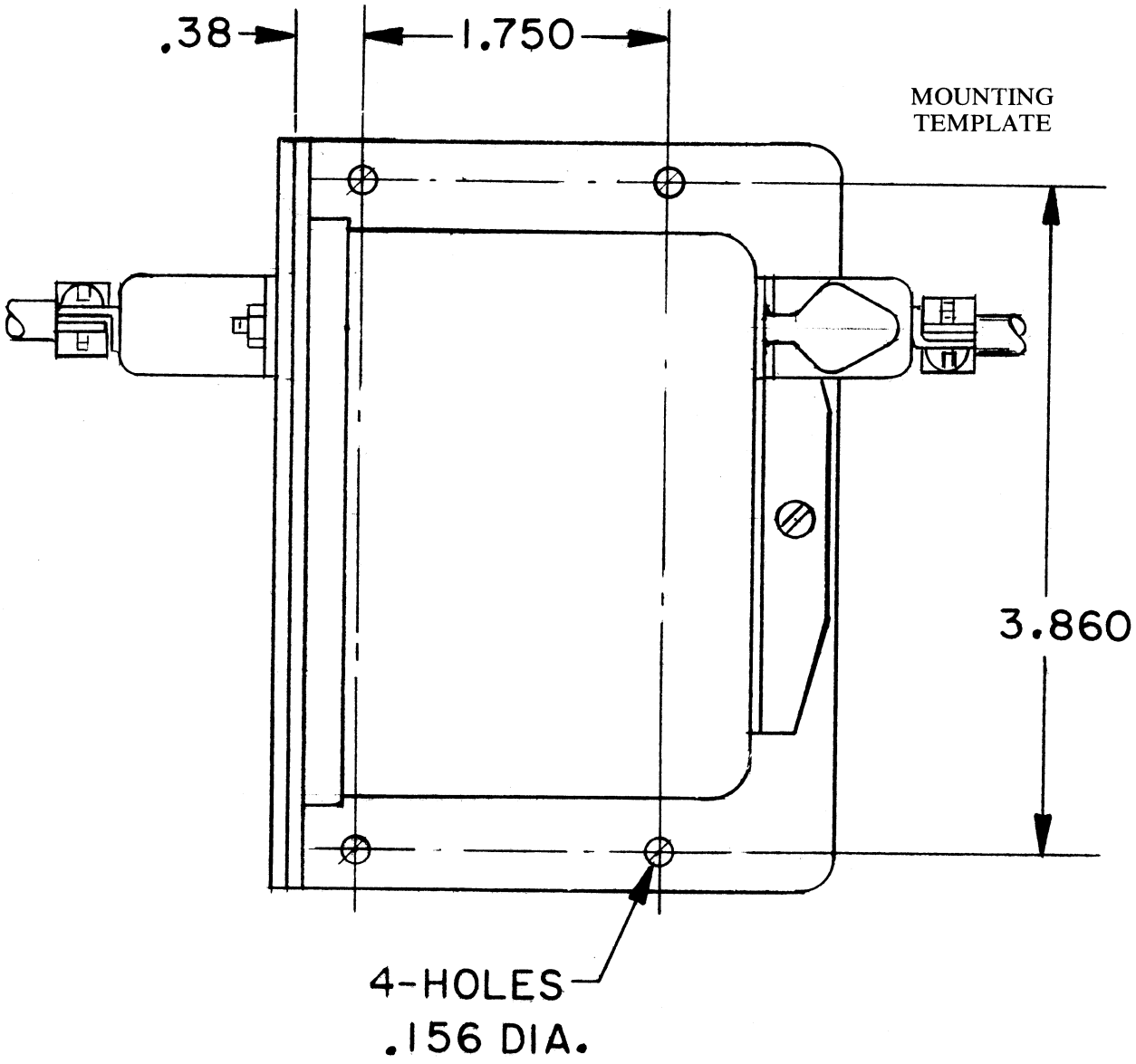


FIGURE 2-15. DGO 10 TSO'd REMOTE CONVERTER MOUNTING

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3.1 GENERAL

The OMNI Converter Section consists of four printed circuit boards mounted under the rear cover of the DGO 10. When shipped, the DGO 10 appears as a one piece unit with a band around its case. This band is a gasket which seals the forward section (GYRO Section) to the rear section (OMNI Converter Section).

Where space is limited the OMNI Converter Section can be removed and mounted elsewhere (a special mounting kit is required, see Section 2.1.1). Of course mounting the DGO 10 as a single unit is easier, quicker, and preferred.

3.2 INSTALLATION

All pertinent information pertaining to specifications, licensing, and installation are provided, in detail, in Section 2 of this manual.

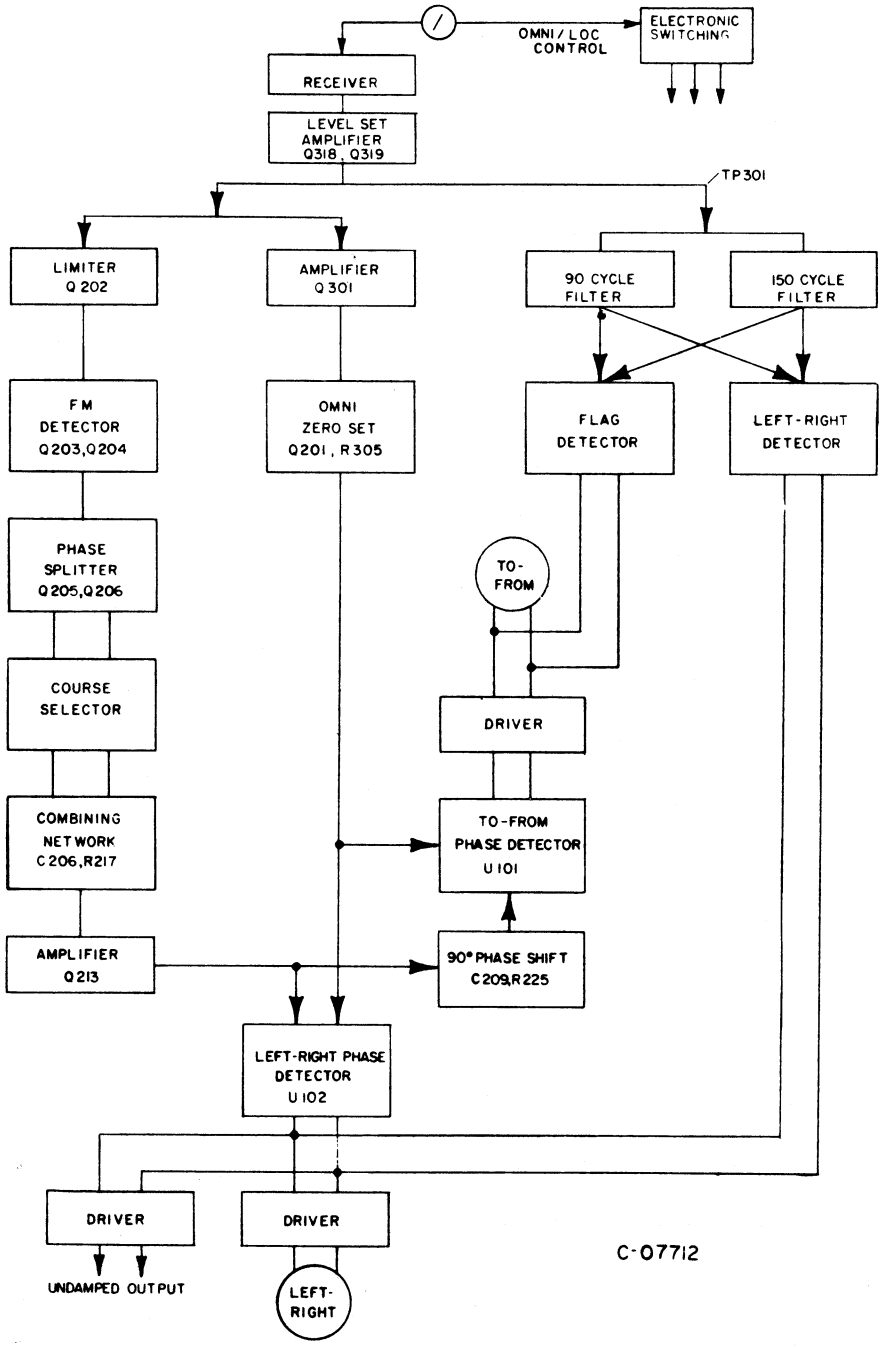


FIGURE 3.3-1 OMNI/LOC BLOCK DIAGRAM

3.3 OMNI CONVERTER SECTION

3.3.1 OMNI/LOC Circuits

Q318 and Q319 form an input amplifier to compensate for differences in the output of the NAV receiver. When the wiper of R348 is set so that R348 is shorted out, the circuit looks like an emitter follower with a voltage gain of 1. (The maximum gain is 2.)

High level signals are applied, in Non-TSO'd models, thru C316 and the voltage divider resistors R344 and R345.
In the TSO'd version, the High Level signals are applied thru C322 and C323.

The combined 30/9960 Hertz OMNI signal from the amplifier (Q318-Q319) is applied to the omni circuit at C301. The filter section composed of R301 and C302 removes most of the 9960 FM signal in addition to causing some 30 Hertz phase shift. This signal is applied to the base of Q301 as the 30 Hertz variable channel. Q301 amplifies the 30 Hertz signal (gain junction of C301 and R301 to collector of Q301 is 2.3).

R305 is the OMNI Zero Set potentiometer. R305 and C201 cause a phase shift in the 30 Hertz signal which is proportional to the resistance of R305. The AC voltage at the base of Q201 is also affected by the resistance of R305. Typical range is .66 - .72 vrms. Q201 is an emitter follower stage which drives the Left-Right and To-From Phase Detector.

The combined 30/9960 Hertz is also applied to the Reference Channel Limiter (Q202) thru C303 which removes much of the 30 Hertz signal leaving the 9960 FM signal. Q202 amplifies and limits the signal and applies it to the FM detector circuit. Q203 and Q204 are turned ON and OFF by the signal from Q202. CR201 is a Zener diode voltage regulator for the FM detector circuit.

C202 and L201 form a resonant circuit at approximately 10.7 KHz. The voltage across L201 is proportional to the frequency of the applied voltage. It will be maximum at the resonant frequency and decrease as the frequency is moved from resonance.

C203 and L202 are resonant at approximately 9.3 KHz. R209 makes the Q of the 10.7 and 9.3 circuits approximately equal. The 9960 FM signal varies plus and minus 480 Hertz from 9960 KHz at a 30 Hertz rate. The resonant circuits therefore convert the FM signal to an AM signal.

The AC voltages from L201 and L202 are detected by diodes CR202 and CR203. C205 filters out the remaining 9960 signal and the result is the detected 30 Hertz reference channel signal with an amplitude of approximately .15 volts rms at C204.

The 30 Hertz signal is coupled to phase splitter Q205 and Q206. The combination of Q205 and Q206 act like a single transistor of very high gain. This 30 Hertz signal is then split into two equal but 180 degrees out of phase signals. The high gain transistor configuration and the precision resistors R214 and R215 are used so that the amplitude of the two split signals will be precisely equal and exactly 180 degrees apart.

The split 30 Hertz signals representing 60 and 240 degrees drive the OMNI bearing selector (OBS) potentiometer.

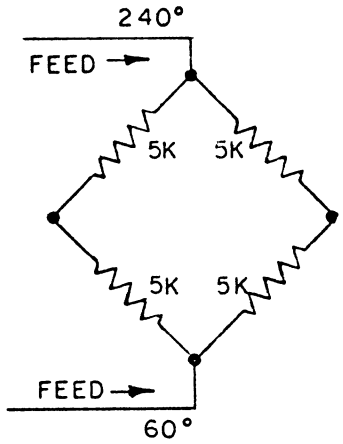


FIGURE 3.3-2 THE BASIC POTENTIOMETER

The basic potentiometer is a linear 20K wirewound element joined together at the ends to form a circle. Taps are provided every 45 degrees around the potentiometer. Ohmmeter measurements between any points 180 degrees apart will be 5000 ohms.

The modified potentiometer has resistors connected from the 45 degree points to the feed point which changes the linear potentiometer into an approximate sine function.

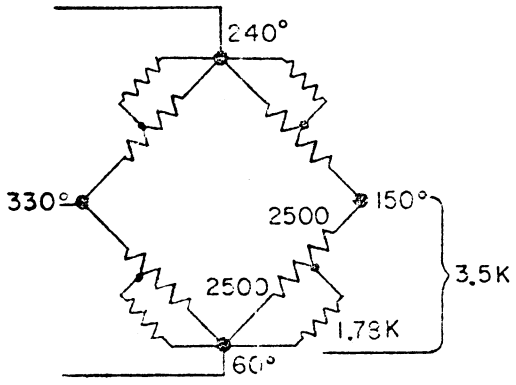


FIGURE 3.3-3 THE MODIFIED POTENTIOMETER USED IN THE DGO 10

3.3.1 (Continued)

The resistance measured from any two points 180° apart with the resistors connected to the pot will be 3.5K.

Since the two feed points are equal voltage and 180° out of phase the voltage at the 330° and 150° points is zero.

The two wiper arms are always (mechanically fixed) 90° apart.

As the wipers rotate they pick up an AC signal varying in voltage and phase.

The output from each of the wiper arms of the OBS potentiometer drives an emitter follower, made of 2 transistors connected for high Beta, Q207/Q208 and Q209/Q210. The two signals are then combined thru C206/R217 and R218. The result is a signal at the junction of C206 and R217 whose phase varies with the OBS dial and whose amplitude is constant.

C207 couples the 30 Hertz signal to amplifiers Q212 and Q213.

CR204 helps maintain the bias point of Q213 over temperature. The output of the collector of Q212 is applied to A102, pins 7/10 in the L-R phase detector. It is also applied to Q211 which inverts its phase. The signal from Q212/Q213 is combined thru C209 and R225 and results in a 90 degree phase shifted signal. This signal is applied to A101, pins 7/10 in the To-From phase detector.

3.3.2 Left-Right Phase Detector

A102 is a multiplier. When the reference and variable 30 Hertz signals are 90 degrees out of phase the voltage output across pins 11 and 12 is zero. The voltage across pins 11 and 12 will vary from zero to around 150 millivolts for 10 degrees of phase difference as the phase between the two 30 Hertz signals vary.

CR102 and CR103 limit the voltage output of the phase detector to prevent damage to the Left-Right meter.

CR104 and CR105 are used in the Localizer switching circuitry. In OMNI operation they are closed.

Q105 and Q106 form a current source to drive the multiplier. R134 adjusts the source current so that the voltage at pins 11 and 12, with an omni signal applied, is approximately 6.5 volts DC.

R108 is a course width adjustment. It loads down the output to give a 5 dot deflection (around 150 millivolts at pins 11/12) for a 10 degree phase shift. The additional resistors, R129, R125, R127, etc., associated with A102 supply proper DC bias to the multiplier. The output of the Left-Right Phase Detector is applied to two isolation amplifiers, U201 and U202, thru isolating resistors R234-R235 and R236-R237.

U201 and U202 are emitter follower drivers for the Left-Right meter and undamped output. R238 and R239 are balance adjustments to make up for slight differences in the transistor pairs.

The output of U201 is connected to the Left-Right meter.

(For Non-TSO'd models)

The Left-Right meter has more damping than the undamped output of U202 because C210 damps the Left-Right needle, however C210 has little effect on the undamped U202 because it is isolated by R234, R235, R236, and R237.

(For TSO'd models)

C402 along with R234, R236, R244, and R245 slightly increases the damping on the undamped output. This reduces the AC ripple on the undamped output and makes its damping the same as ARINC specifications.

It is however damped less than the internal L-R meter which is equal to that of NARCO's NAV 111 and 112.

The external output J401 pins 4 and 5 from the emitter followers is a voltage of approximately 150 millivolts for a 10 degree phase difference. This voltage will be only slightly effected by the load connected to the output. Therefore, if a high impedance autopilot or a 1000 ohm standard meter is connected to the output, the voltage output will be the same.

3.3.3 To-From Detector

The reference and variable 30 Hertz channels are shifted 90 degrees and applied to the To-From Phase Detector.

Essentially this detector operates the same as the Left-Right Phase Detector. The only appreciable difference is that there is no gain adjustment resistor connected across pins 11 and 12 of A101. (A102 has resistor R108) Flag current is set by R112.

3.3.4 OMNI/LOC Switching Circuits

Electronic switching is used for OMNI and Localizer operation. Refer to Figure 3.3-4.

OMNI MODE

In OMNI mode the localizer activate lead (terminal J401-17) is open (ungrounded). Q108 is therefore turned ON by current flow thru R134 and R141. This brings SW2 to approximately ground potential.

With Q108 ON, the current flow causes a voltage drop across R138 turning Q107 ON. With Q107 ON, SW1 is brought to approximately 9 volts. With Q108 ON, the base of Q214 is connected to ground causing Q214 to be turned OFF. With Q214 OFF, there is no drive to Q215, thus Q215 is OFF.

With Q214 ,and Q215 OFF, the Localizer + (plus) and - (minus) leads are floating as if they were not connected. The localizer Left-Right and To-From detectors have no voltage applied to them so that even though they are still connected to the OMNI circuit, they do not effect the OMNI Left-Right or To-From indicators. The voltage measured at each side of C211 during OMNI operation (about 6 volts) is the result of the voltage fed into the Localizer from the L-R and To-From circuits.

In OMNI operation Q214 and Q215 could be removed from the circuit with no change in operation. Also while in OMNI operation, as a result of the voltage (+9v) applied by the switching circuits (SW1), CR101, CR104, and CR105 are closed, and the wiper of R113 is grounded.

LOCALIZER MODE

In Localizer mode J401-17 is grounded by the Receiver channeling switches.

When Q108 is turned OFF, the current thru R138 decreases so the voltage across R138 decreases, and Q107 is turned OFF.

SW2 is no longer at ground potential so the OMNI To-From flag emitter follower drivers, Q101 and Q102, are OFF and the To-From flag is free to follow the Localizer command.

SW1 is no longer connected to +9 volts which turns OFF the OMNI Left-Right and To-From Phase Detectors.

When Q108 is OFF, the collector of Q108 increases in voltage turning Q214 ON. When Q214 is ON it turns Q215 ON. When Q214 is ON it supplies +9 volts to the Localizer circuitry. When Q215 is ON it grounds the negative side of the Localizer circuitry. The Localizer is thus operational.

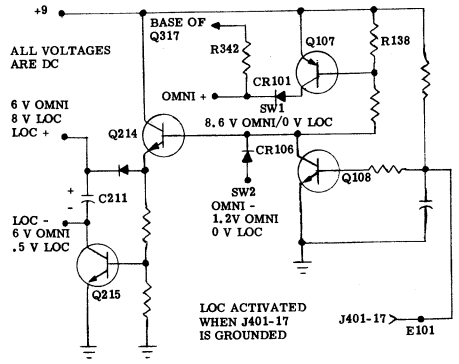
Diodes CR101, CR106, and CR206 prevent current from flowing from the OMNI circuit to the switching circuitry when in localizer mode and prevents current from flowing from the Localizer circuitry to the switching circuitry when in OMNI mode.

In Localizer mode, Q107 and Q108 could be removed with no change in operation.

(For TSO'd Models)

CR107 raises the emitter of Q108 about .5v to compensate for the .5v drop across CR108. This insures that Q108 is OFF when J401-17 (LOC ACT) is grounded. CR108 prevents sneak paths from locking the DGO 10 in LOC mode when LOC ACT lead is connected to other equipment.

Non-TSO'd Model (CN 208)



TSO'd Model (CNG219)

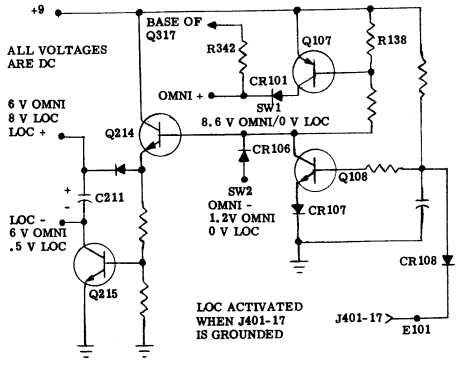


FIGURE 3.3-4 OMNI/LOC SWITCHING

3.3.5 Localizer Circuitry

The LOC signal from the level amplifier Q318 and Q319 is applied to the Localizer Circuitry at TP301.

R348 controls the signal level to the active filters and thus controls the LOC course width.

A. 90 Hz Filter

The 90 and 150 Hertz audio signal is fed thru C304 (C318 in the TSO'd model) to the electronic filter. R306 and R307 bias the base of Q302 to about 4.6 volts DC.

Q302 and Q303 form a differential amplifier with the output taken from the collector of Q302. This output drives the base of the single stage amplifier, Q304. The output from Q304 is developed across load resistor R316 and drives the To-From and Left-Right Detectors. The output of Q304 also feeds a bridge T audio filter (R314, R315, R310, C305, C306, and R311) that is tuned to 90 Hz.

NOTE: For determining the filter frequency the two resistors (R310 and R311 etc.) act as if they are connected in parallel. The bridge T filter has a notch response.

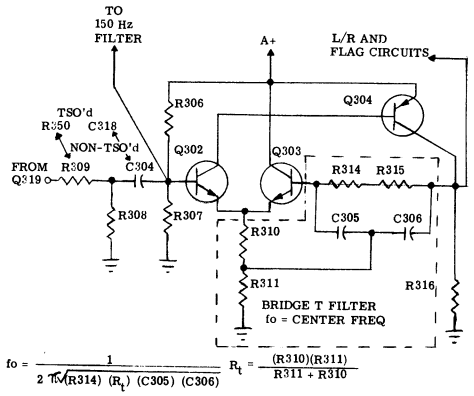


FIGURE 3.3-5 BRIDGE T FILTER

The output of the bridge T filter is applied to the base of Q303 (½ of the differential amplifier). If an audio frequency signal other than the notch frequency is applied to the base of Q302, it is amplified by Q302, applied to the base of Q304, amplified by Q304, and passed back thru the bridge T filter to the base of Q303. This voltage at the base of Q303 is of the proper phase (negative feedback) to oppose the voltage applied to the base of Q302. The net result is that because of the feedback cancelling, the voltage output at the collector of Q304 is low.

If a signal is applied at the notch frequency the process is the same, except that the filter passes very little of the signal. There is thus little voltage applied to the base of Q303 and little cancelling, and the voltage at the collector of Q304 will be large. Since the feedback network plays a dominant role in determining the gain of the circuit, the gain is quite independent of variations among transistors.

The gain and center frequency of the filter amplifiers is dependent on the exact values of the bridge T filter components. Because of normal component tolerances, R315 is selected during production to tune the filter to 90 Hz.

B. 150 Hz Filter

The 150 Hertz filter is the same as the 90 Hertz filter except for the values of the components in the bridge T filter that tune it to 150 Hertz instead of 90 Hertz.

C. Left-Right Detector

(For Non-TSO'd models)

The 90 and 150 Hertz signals are applied to the Left-Right Detector, Q309 and Q311. Q308 and Q310 are connected as diodes and along with R320 and R323 form a DC biasing network. Q309 amplifies the 90 Hertz signal and Q311 amplifies the 150 Hertz signal. If equal 90 and 150 Hertz signals are applied, the voltage at R325 will not change. If the 90 and 150 Hertz signals are unequal, the voltage at R325 will move and the Left-Right needle will deflect.

(For TSO'd models)

The 90 and 150 Hertz signals are attenuated by R355 and R357 and then applied to the Left-Right Detector, Q309 and Q311. Q308 and Q310 are connected as diodes and along with R351 and R354 form a DC biasing network. Q309 amplifies the 90 Hertz signal and Q311 amplifies the 150 Hertz signal. If equal 90 and 150 Hertz signals are applied, the voltage at R358 will not change. If the 90 and 150 Hertz signals are unequal, the voltage at R358 will move and the Left-Right needle will deflect.

D. To-From Detector

R327, R328, R330, R332 and R333 form a DC biasing network for the To-From Detector. The 90 and 150 Hertz signals are amplified and applied to Q312 and Q315. If both signals are present, Q312 and Q315 are both turned ON and current will be applied to the flag meter.

3.4 OMNI MAINTENANCE

NOTE: Should the DGO 10 be installed using the split apart method, and the unit was wired as recommended, the Gyro and Glide Slope will continue to operate when the OMNI Converter Section is disabled or removed.

To operate the OMNI Converter Section the OBS and meters in the Gyro are needed. If desired, a test fixture can be made using a NAV-11 OBS and meter so that the Gyro could be left in the aircraft while servicing the OMNI Converter Section.

3.4.1 Adjustment Locations

See foldout Figure 3.4-4 or 3.4-4A for adjustment locations.

3.4.2 Test Equipment Required

a) OMNI Signal Generator, TIC's T-12A or equivalent
b) 14v Power Supply, Electro Products Lab, Model NFB or equivalent
c) VTVM, RCA Senior Voltohmyst or equivalent
d) Audio Oscillator, Hewlett-Packard 200CD or equivalent
e) Oscilloscope, Tektronix 515A or equivalent
f) a 1000 ohm, 150 ua meter.

3.4.3 Test Set-up

The DGO-10 Omni Converter Section can be aligned and maintained with or without a receiver. If receiver problems are suspected (such as a bad crystal filter which can cause omni errors) a demodulated omni signal can be connected to the omni circuitry without going thru the receiver. Other than omni zero set, the omni should not be compensated with the idea of removing receiver induced errors. (Typical, ± 1° of error can be expected from receivers)

Most of the measurements are made with a standard omni signal applied to the receiver at 500 microvolts. At this RF level the receiver is well into AGC action and the detected voltage at the input to the omni localizer converter (J401-16) is set (at manufacture) for .3 vac rms measured with the 30 Hertz signal only present, and with the 9960 signal only present, there will be .1 to .3 vac rms depending on the receiver. The amplitude of the 9960 signal does not have as much effect on the equipment operation as the 30 Hertz signal, as the 9960 signal goes to a limiter.

When a direct omni connection is made without a receiver, a low level demodulated signal is applied to pin 16 of J401. Of course the following connections must be made to J401: A+, ground, LOC activate a 1K resistor between pins 1 and 6, and the low level jumper between pins 15 and 20.

The generator demodulated amplitude should be adjusted so that at J401-Pin 16, with the system connected, there is .3 vac rms of 30 Hertz measured with the 9960 signal deleted. This will result in .3 vac rms of 9960 with most generators.

NOTE: Measure with one signal present at a time because different voltmeters will read differently with both signals present at the same time.

CAUTION:

Some signal generators, such as the H-14A, have large DC and AC voltage output at the demodulation output. Applying a large DC voltage can damage the radio.

The following attenuator/DC blocking circuit is recommended for use with the H-14A.

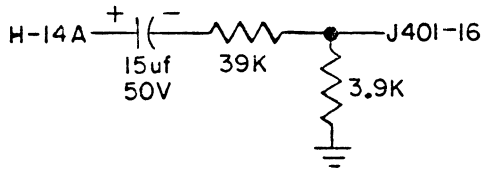


FIGURE 3.4-1 ATTENUATOR/DC BLOCKING CIRCUIT

Localizer operation:

Since the standard omni signal is 30% modulation for both the 30 and 9960 Hertz signal and the localizer signal is 20% modulated for both 90 and 150 Hertz signals there should be .3 vac in the omni mode and .2 vac in the Localizer mode.

CAUTION:

Many pots are protected from undersired changes, such as vibrations, by having a glob (dab) of silicon rubber applied to the pot at the factory. This material has a certain amount of "memory". Therefore if a pot requires readjustment, cut away the silicon rubber completely, adjust the pot, and resecure the pot on the back with a glob of silicon rubber.

3.4.4 Alignment Procedures

(SEE FIGURE 3.4-4(4A) for Test Points and step by step component locations.

Connect a 1000 ohm, 150 ua meter to the output of J401, pins 4 and 5.

A. Power Supply Adjust

(1) Set the power supply to 13.75 volts and connect the VTVM to the emitter of Q401.
(2) Adjust R406 for 9.0 vdc on the VTVM.
(3) Check high and low line (11.0 vdc-15.0 vdc). The 9 volt line shall not vary by more than 0.4v.
(4) Set the power supply back to 13.75v.

B. DC Balance Adjust (OMNI)

(1) Remove input signal to omni.
(2) Channel to an omni frequency.
(3) Place a jumper (short) from CR104's cathode to CR105's cathode.
(4) Adjust R238 for zero deflection of the Left-Right meter.

NOTE: Because of the longer time constant on the Left-Right needle wait for the pointer to come to rest before completing this adjustment.

(5) Adjust R239 for zero deflection of the external meter. (Steps 4 and 5 should be set very accurately.)
(6) Redo steps 4 and 5 as often as necessary until both meters are centered.
(7) Remove the jumper (short) between CR104 and CR105. Connect the VTVM to CR104 or CR105's cathode. If the voltage reads between 6.0 and 7.2 volts proceed to step 10.
(8) Remove R134 and using the resistor substitution box, select a value which will give 6.5 plus or minus 0.3 vdc at CR104's or CR105's cathode.
(9) Turn the power OFF and install the selected value resistor. Turn power ON and verify step 7.
(10) Connect the VTVM to either side of C101. If the voltage reads between 6.0 and 7.2 volts proceed to step 13.
(11) Remove R121 and using the resistor substitution box, select a value which will give 6.5 plus or minus 0.3 vdc at C101.
(12) Turn power OFF and install the selected value resistor. Turn power ON and verify step 10.
(13) Connect a standard omni signal.
At this time check that the internal Left-Right and the external Undamped Output meters track closely. 2 dots on the internal meter equals 150 ua on external meter. Check both Left and Right deflection . . . if they do not track, stop and repair before proceeding further.

C. Discriminator Tuning

(1) Connect an audio oscillator, set to around 10 KHz, to the omni generator external modulation input.

NOTE: If the omni is being driven direct, without a receiver, connect the audio oscillator in place of the omni signal, directly to the omni converter.

(2) Connect a scope to the junction of L201 and C202. Keep the percent of modulation (or audio oscillator level) low so that the waveform at L201 is not distorted (the percent modulation will be very low). Tune the audio oscillator frequency for maximum voltage. The peak should occur at 10.7 KHz, if not, select or pad C202 to peak at 10.7 KHz.
(3) Move the scope to junction L202 and C203. Repeat step 2, only at this time peak at 9.3 KHz.
(4) Reconnect the test set-up for normal omni test.

D. Course Width

(1) Place signal generator at any bearing and turn OBS till Left-Right needle is centered.
(2) Change the omni generator or the OBS dial 10 degrees. Select R108 for 2 dot deflection on the Left-Right meter.

E. Phase Comparator Null

(1) Connect a 50 uf, 10v or larger electrolytic capacitor from the junction of C105 and R109 to ground (negative side grounded).
(2) Set the omni generator so only the 9960 FM signal is produced and adjust R105 for zero deflection on the Left-Right meter.
(3) Disconnect the omni signal from the omni and adjust R126 for zero deflection on the Left-Right meter.
(4) Repeat steps 2 and 3 till both conditions are met.
(5) Remove the capacitor.

NOTE: Steps 2 and 3 should be set very accurately. It will usually take a few repeats to get proper balance.

(6) Recheck step D, Course Width

NOTE: U101 and U102 are selected by NARCO from standard RCA CA3026 devices for proper balance.

3.4.4 (E) (Continued)

If a CA3026 is used which has not been selected it may balance correctly but then show large reciprical or course errors or it may not be possible to balance it at all.
The To-From detector, U101, is not as critical as the Left-Right detector, U102. The U102 part can be used for To-From but the U101 cannot be used for the Left-Right.

Be sure to order and use the proper part from NARCO. (U101 P/N 74012-0003 or U102 P/N 74012-0002)

CAUTION: When using a soldering iron in this area it is possible to heat up a diode or other component so that the balance will be affected. Use minimum heat and keep iron away from other components. Use clip leads to connect resistor boxes to circuit.

F. Course Selector Alignment

(1) The course selector in the Gyro Section of the instrument is mechanically set at manufacture and no adjustment is possible.

The potentiometer can be checked by referring to schematic Figure 3.6-1 and checking resistance. The potentiometer itself is 20K wound on a closed loop. Therefore, with the added resistors the maximum resistance which is measured from points 180° apart will be 3.5K. Pins 14 and 17 should have minimum resistance when the OBS reads approximately 240 degrees, plus or minus approximately 5 degrees and potentiometer pins 13 and 17 will have minimum resistance at 330 degrees.

G. OBS Phase Adjustment

(1) Set the signal generator and the OBS dial to 105 degrees. Adjust omni zero set (R305) for zero deflection on the Left-Right meter.
(2) Set the signal generator and the OBS dial to 285 degrees. Use omni zero (R305) to split the error.
(3) Repeat steps 1 and 2 to verify error split.
(4) Place signal generator and OBS dial to 195 degrees. Connect a resistor substitution box for R219 across R218. Remove any resistor already at R219 position.
(5) Select R219 for zero deflection on the Left-Right meter.
(6) Place generator and OBS dial to 15 degrees. Check that the zero on the meter is less than plus or minus 1 degree. (If error exceeds plus or minus 1 degree use R219 to split the error.)
(7) Turn power OFF and install selected value. Turn power ON and check steps 5 and 6.

NOTE: If the course selector is properly aligned mechanically, R219 will have no effect on the Left-Right indicator when the OBS is set to approximately 105 degrees or 285 degrees.

If changing R219 effects the course setting by more than about 1 degree when the OBS is set at 105 or 285 degrees, something is wrong and compensation is not possible.

H. To-From Crossover Adjustment

(1) Place signal generator to 15 degrees. Remove the omni signal.
(2) Adjust R113 for zero deflection of the To-From meter. Reconnect the omni signal.
(3) Rotate the OBS dial to 105 degrees and adjust R224 for zero deflection on the To-From meter.
(4) Rotate the dial to 285 degrees and observe the To-From meter. Use R224 to split the error.
(5) Check steps 3 and 4 to verify the error split.

I. Flag Sensitivity Adjustment (Omni)

(1) Place the signal generator and OBS dial to 15 degrees.
(2) Turn OBS till Left-Right needle is deflected exactly full scale (2 dots).
(3) Reduce RF input level till Left-Right needle deflects 1 dot.
(4) Set R112 so flag changes from OFF to a JUST centered white arrowhead (triangle).

CAUTION

LOCALIZER Adjustment is not the same for Non-TSO'd Models and TSO'd Models!

FOLLOW THE PROPER SET OF PROCEDURES.

NON-TSO'd

J. DC Balance (Localizer)

(1) Channel to a localizer frequency and set generator for localizer.

(2) Remove the signal to the omni/loc converter. Vary localizer zero (R325) from full CW to full CCW position while observing the Left-Right meter. If indication in either case does **not** exceed plus or minus 10ua or external meter set for zero deflection and go to next adjustment, "K".

(3) Set R325 to its mid-position. (Physical not electrical) Connect a resistor substitution box to the set of R241 terminals which will bring the Left-Right meter towards zero deflection. Select a resistor which will zero the meter.

(4) Turn the power OFF and install the selected resistor.

(5) Repeat step 2.

K. 90 Hz Filter

(1) Reconnect the signal to the omni/loc converter and set the generator so the 90 Hertz signal only is generated. Connect a scope or AC voltmeter to TP303 and connect a resistor substitution box to R315.

(2) Adjust the resistor box for maximum signal on the scope.

(3) Turn the power OFF and install the selected value. Turn the power ON.

L. 150 Hz Filter

(1) Set the generator for 150 Hertz only. Connect a resistor substitution box to R319. Connect the scope to TP302.

(2) Repeat steps K2 and K3.

M. Localizer Sensitivity

(1) Set the localizer switch to Zero db. Adjust localizer zero (R325) for zero deflection on the Left-Right meter.

(2) Set the tone localizer switch to -4 db, 90 Hertz for right deflection. Adjust R348 for 1.2 dots (90 ua on external meter) on the Left-Right meter.

(3) Set tone localizer switch to 0 db. Recheck localizer zero.

(4) Set the tone localizer for -4 db, 150 Hertz and check Left deflection.

When adjusting R348 it will be found that if R348 is increased too much the LOC deflection will decrease. Be sure to start with R348 so the proper deflection is reached before the maximum deflection occurs.

TSO'd

J. Detector Balance (Localizer)

(1) Channel to a localizer frequency and set generator for localizer.

(2) DC Balance (centering)

Remove all modulation from a 1 Kuv carrier; indicator should center within one pointer width. R241 may be selected to center the pointer. Selected value should be in excess of 1 megohm. Do not install this selected resistor at this time.

(3) AC Balance (deflection)

Set signal generator modulation for 90 Hz ONLY. From the generator demodulated output apply, thru a 0.47 mfd coupling capacitor, the 90 Hz tone to TP305. Adjust the 90 Hz amplitude to produce 1.2 dots left deflection. In many generators this may be accomplished by varying the percent modulation setting.

Set signal generator modulation for 150 Hz ONLY. From the generators demodulated output apply, thru a 0.47 mfd coupling capacitor, the 150 Hz tone to TP304: Deflection should be 1.2 dots right, ±1 pointer width. R358 may be adjusted to balance the deflection.

(4) Repeat steps 2 and 3 until their individual requirements are met. This is necessary due to interaction between the DC and AC balance adjustments.

(5) Turn power OFF and install the selected value for the DC Balance, step 2.

K. 90 Hz Filter Tuning

(1) Apply to the converter a 90 Hz ONLY tone of 0.2v rms measured at J401-16. Adjust R348 for 0.06v rms at TP301.

(2) Connect a scope or AC voltmeter to TP303 Select R315 for maximum AC voltage. Nominal value is 18K ohms.

(3) Turn power OFF and install the selected value resistor.

L. 150 Hz Filter Tuning

(1) Apply to the converter a 150 Hz ONLY tone of 0.06v rms measured at TP301.

(2) Connect scope or AC voltmeter to TP302. Select R319 for maximum AC voltage. Nominal value is 18K ohms.

(3) Turn power OFF and install the selected value resistor.

FOR TSO'd Models

M. Localizer Deflection and Centering

(1) Apply to the converter a standard centering signal (ie: at J401-16, 0.2 v rms of 90 Hz and 0.2 v rms of 150 Hz) and adjust R355 for a centered pointer.

(2) Set the tone localizer switch to - 4 db, 150 Hz for left deflection. Adjust R357 for 1.2 dots deflection.

(3) Repeat steps 1 and 2 until their individual requirements are met.

(4) Set the tone localizer switch to - 4 db, 90 Hz for right deflection. Deflection should be 1.2 dots.

N. Flag

(1) Apply to the converter a standard centering signal. The flag shall indicate "TO".

(2) Set the tone localizer switch to - 4 db, 150 Hz and note deflection.

(a) decrease the signal input level until deflection is approximately 1.0 dot. Flag must indicate "TO".

(b) further decrease the signal input level until the deflection is 0.6 dot. The alarm portion of the flag must at least begin to show.

If these requirements are not met R348 may be adjusted, however, it will then be necessary to repeat the Localizer Deflection and Centering procedure (step M). When adjusting R348 it will be found that if the AC voltage at TP301 exceeds approximately 0.1 v rms the localizer deflection may decrease. If this occurs, the deflection will not be proportional to the difference in depth of modulation.

(3) With a single localizer modulation tone (ie: 90 Hz or 150 Hz) of 0.2 v rms, at J401-16, the alarm portion of the flag should remain visable. If the "TO" portion of the flag is visable, R315 or R319 may be varied ±20% from their selected value.

3.4.5 Maintenance Procedures and Hints

Refer to Figs. 3.4-1 thru 3.4-3.

1. Check that B+ is 9 volts.
2. Check that the signal to J401, pin 14 or 16 is of the proper amplitude.
3. Check that the internal Left-Right meter and an external meter (150 ua, 1000 ohms is connected to J401, pins 4 and 5) track. Check both Left and Right deflection. If they do not track, repair before proceeding further.
4. With no signal applied and the receiver channeled to an omni frequency, measure the DC voltage at pins 11 and 12 of U101 (To-From Phase Detector) and U102 (Left-Right Phase Detector). This voltage should be between 6 and 7.2 vdc. If incorrect, find the trouble and then adjust the voltage as explained in the alignment procedure 3.4.4.B. The measured DC voltage found at U102, pin 11 should be also at U102, pin 12. The voltages of U101 are checked-out in the same manner.

   NOTE: The localizer and omni circuitry are connected together all the time. For the electrical switching to work properly the phase detector (U101 and U102) voltages must be in the proper ranges. If they are out of range, interaction of omni and localizer circuits is possible. This may show up as weak needle swing or uneven Left and Right swing.

5. Incorrect Voltage at Pin 11 and 12 of U101 or U102.

   If the voltage is high, the current source (Q103/Q104 or Q105/Q106) may be bade.
   If, for example, Q103 opens, there would be no current flow in the device and no voltage drop across the resistors connected to pins 11/12. The voltage at pins 11/12 would then tend to rise towards the supply voltage. The device U102 could also be bad.
   If the voltage is high (8 to 9 volts) connect a jumper from the collector of Q103 or Q105 to ground. If the voltage should come down to around 1 volt or less, the current source is probably bad. If the voltage is low, it means the current is high. Q103 (or Q105) could be shorted out, thereby causing the high current.
   R121 (and R134) control the current sources. The higher the resistance, the lower the current.

6. LOC/OMNI Switching and Interaction troubles.

   Interaction on switching troubles will usually show up as the LOC loading the omni. The unit may or may not perform properly in Localizer mode.

   Measure the DC voltage across C211. In Localizer mode the minus side of C211 will be .5 vdc and the plus side will be around 8 vdc. In Omni mode there will be around 6 volts on both sides of C211. If, in OMNI mode, the voltage on both sides of C211 are not equal, it is an indication that Q214 and Q416 are not switching properly. If the voltage is much different from 6 volts it may be a shorted transistor in the Left-Right or To-From localizer detector circuits.

   The Left-Right (E219/E220) and the To-From (E115/E116) interconnections in the omni and localizer circuit may be disconnected and checked separately

   In OMNI mode SW1 will have around 8.8 vdc and SW2 around 1.2 vdc.

   In LOC mode SW1 and SW2 will be at zero volts.

7. The AC voltages shown on the maintenance diagrams can be used to signal trace the equipment. The actual voltages are not critical in most cases and will vary because of component tolerances from unit to unit.

   The phase detector circuits are driven hard and thus operate into limiting. This means that the course width will not change much with a change in the 30 Hertz drive voltages until they change by a large amount.

   The point at which full flag is reached will vary with the 30 Hertz drive since this occurs with low drive voltage.

   R348 level set therefore has an effect only on the omni around flag sensitivity and not course width.

8. Localizer

   The localizer input at J401-16 is .2v rms, 90 Hertz signal and a .2v rms, 150 Hertz signal.

   Check TP301 for proper voltage.

   TP303 is the output of the 90 Hertz filter. This voltage will be approximately 1.2v rms for .2v rms of 90 Hertz at J401-16.

   When an off course signal is applied to the Localizer, the amplitude of one channel will increase and the other decrease. Therefore the filter amplifier must be able to produce an output of around 2.4v rms.

   Observe TP303 and increase the voltage to J401-16 with 90 Hertz only applied. See that you get 2.4v rms with approximately .4v rms at J401-16. The waveform should look like a nice sinewave.
   Repeat the above at TP302 with 150 Hertz applied.

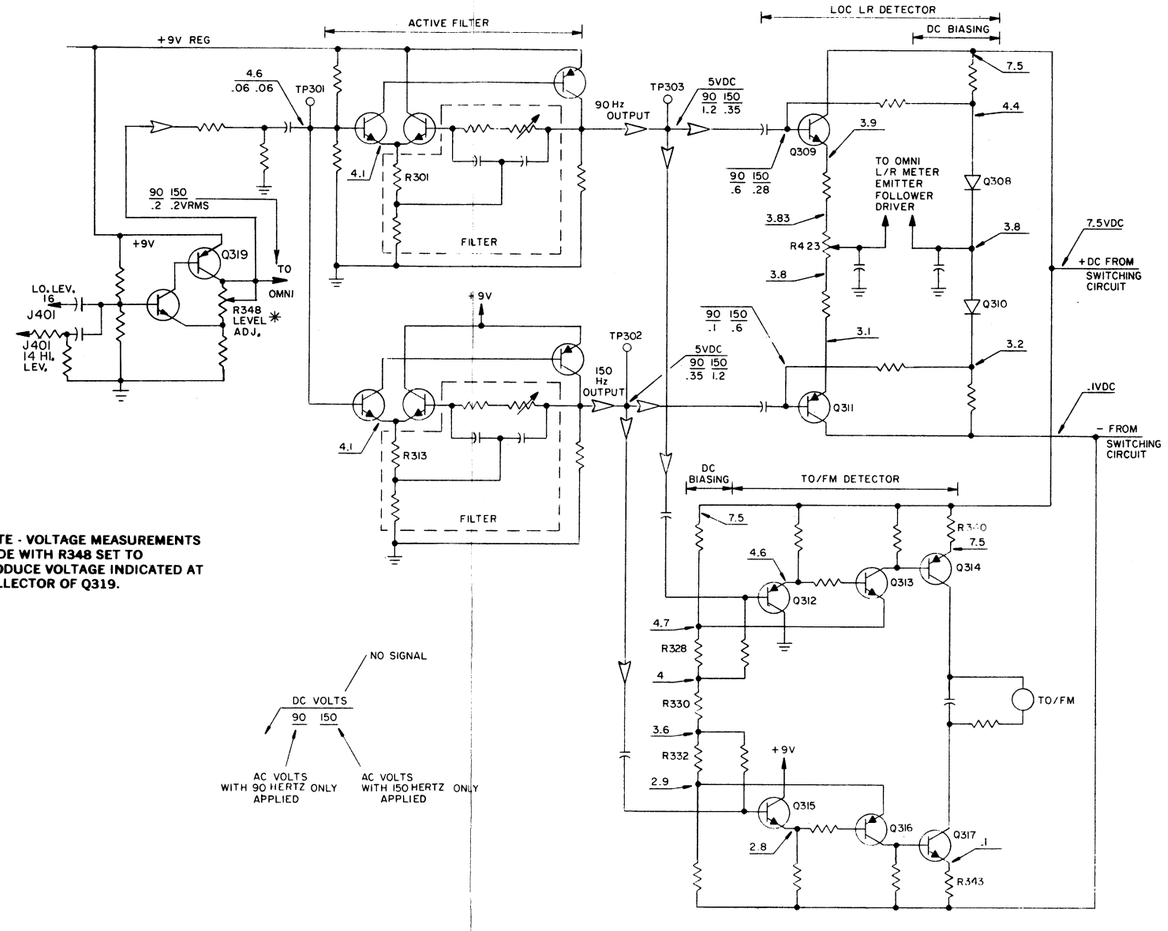
   NOTE: Localizer course width is a function of input voltage and R348's setting in contrast to omni course width which is relatively uneffected by R348 or the input voltage.

   The deflection is adjusted by R348. As R348 is increased a point will be reached where the Left-Right deflection will start to decrease instead of increase. This occurs when the active filters are producing their maximum output.

   Always start with R348 minimum and be sure not to go higher than required for proper deflection.

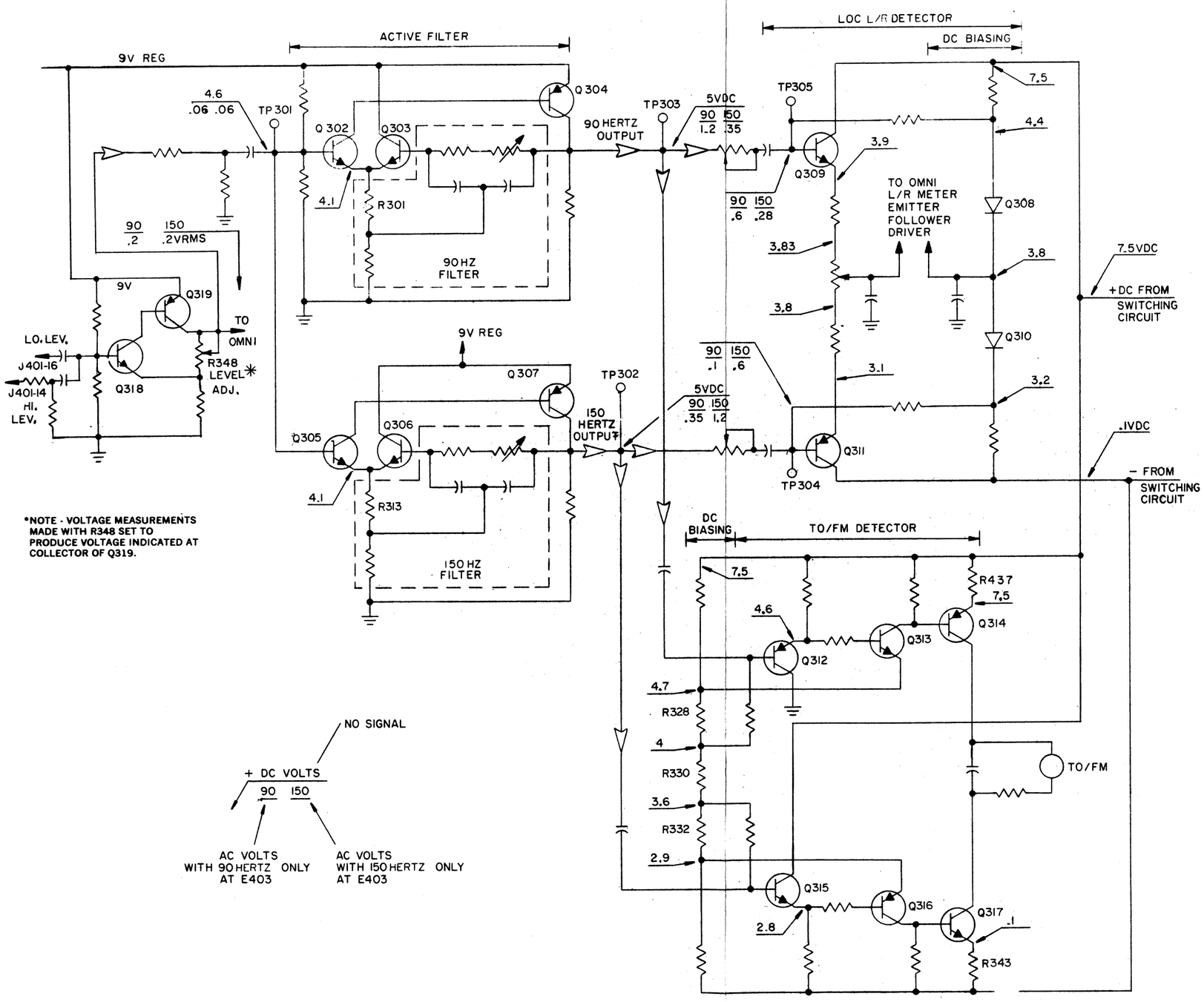
The combined omni signal is applied to pin 14 or 16 of J401 depending on whether it is high level (around 3 volts) or low level (.3 volts) omni signal. Q318 and Q319 form an amplifier. R348 is the level adjustment and is used to compensate for variations in input level from different receiver.

NOTE: R348 level adjust is used as the localizer course width control. It also controls the signal level applied to the omni circuits but does not control omni course width because the the omni phase detector circuits are driven hard and operate in limiting. R348 will affect omni flag sensitivity since at very low levels the circuits do not operate in limiting.



***NOTE - VOLTAGE MEASUREMENTS MADE WITH R348 SET TO PRODUCE VOLTAGE INDICATED AT COLLECTOR OF Q319.**

FIGURE 3.4-2 NON-TSO'd LOCALIZER MAINTENANCE INFORMATION



*NOTE - VOLTAGE MEASUREMENTS MADE WITH R348 SET TO PRODUCE VOLTAGE INDICATED AT COLLECTOR OF Q319.

FIGURE 3.4-2A TSO'd LOCALIZER MAINTENANCE INFORMATION

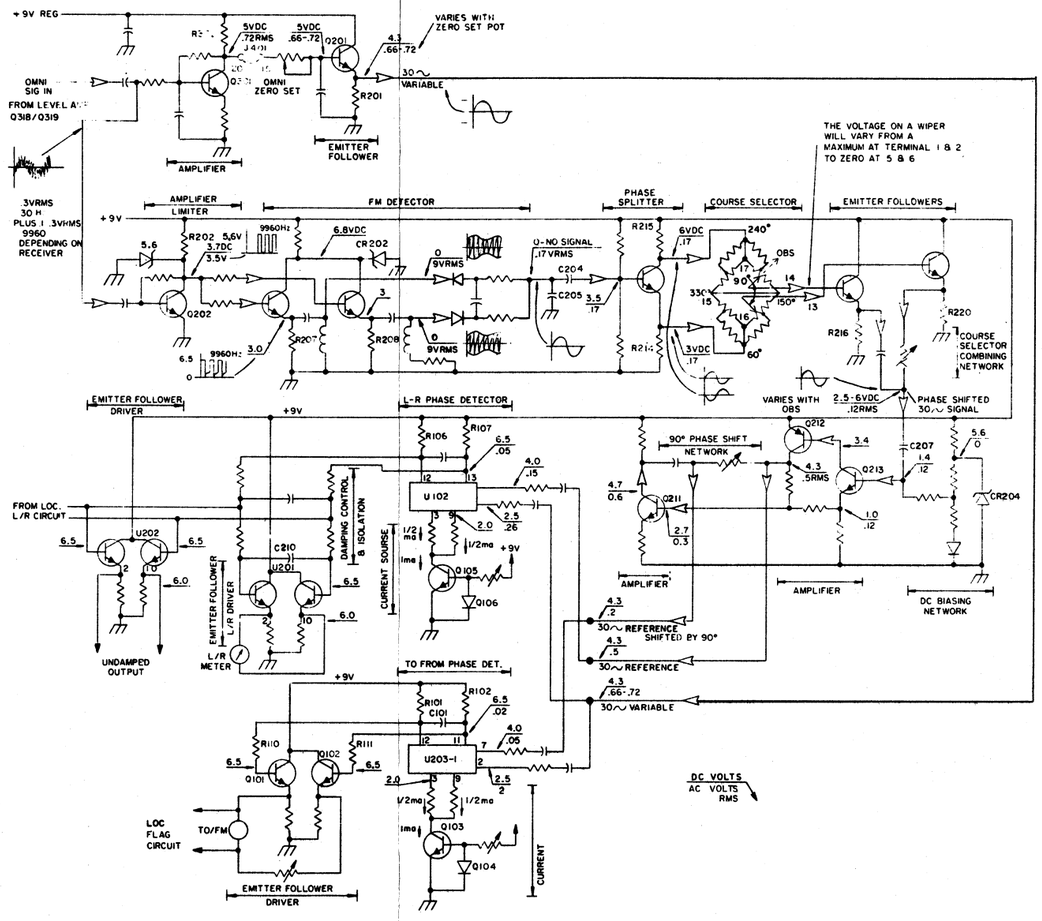


FIGURE 3.4-3 NON-TSO'd OMNI MAINTENANCE INFORMATION

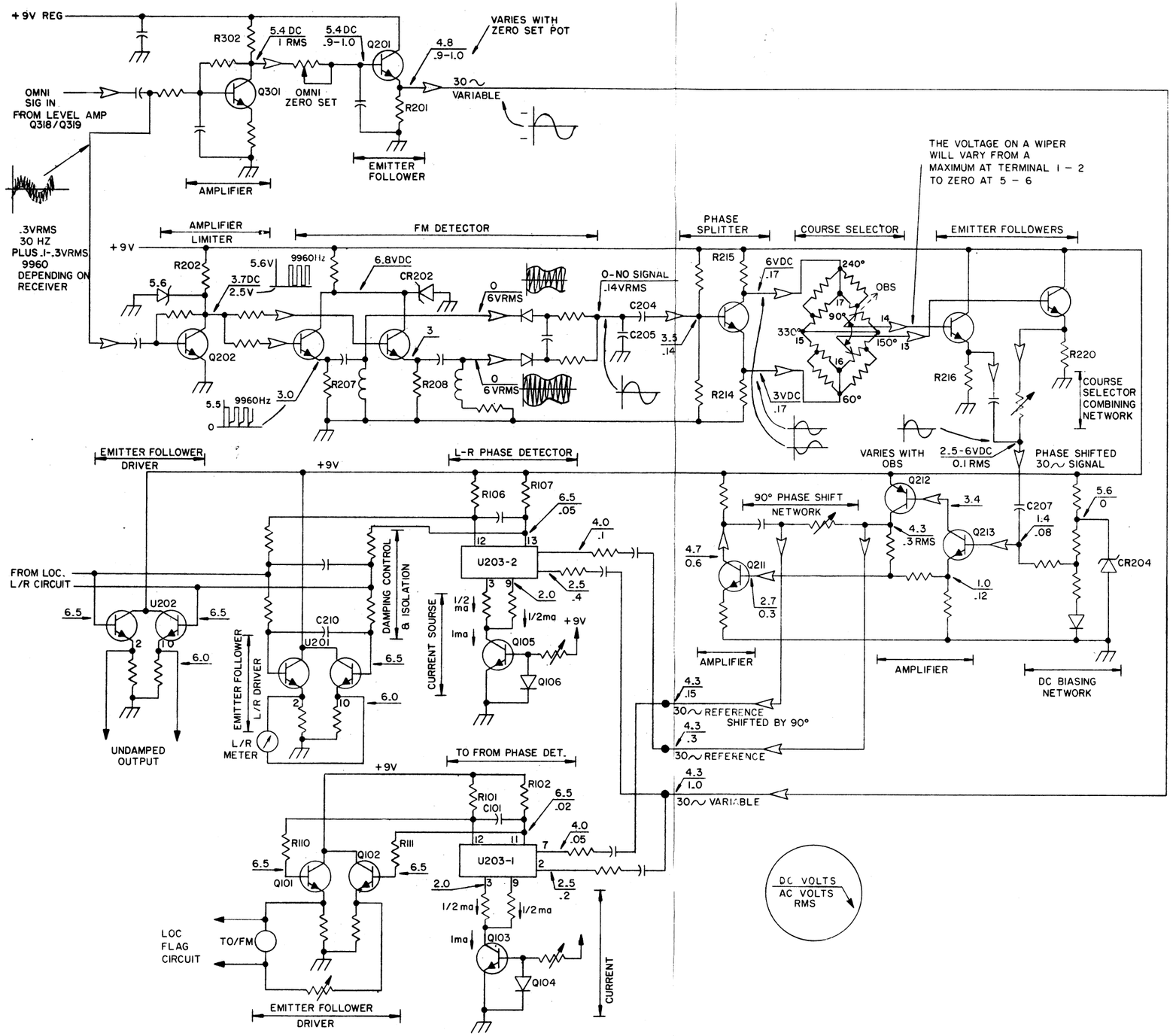
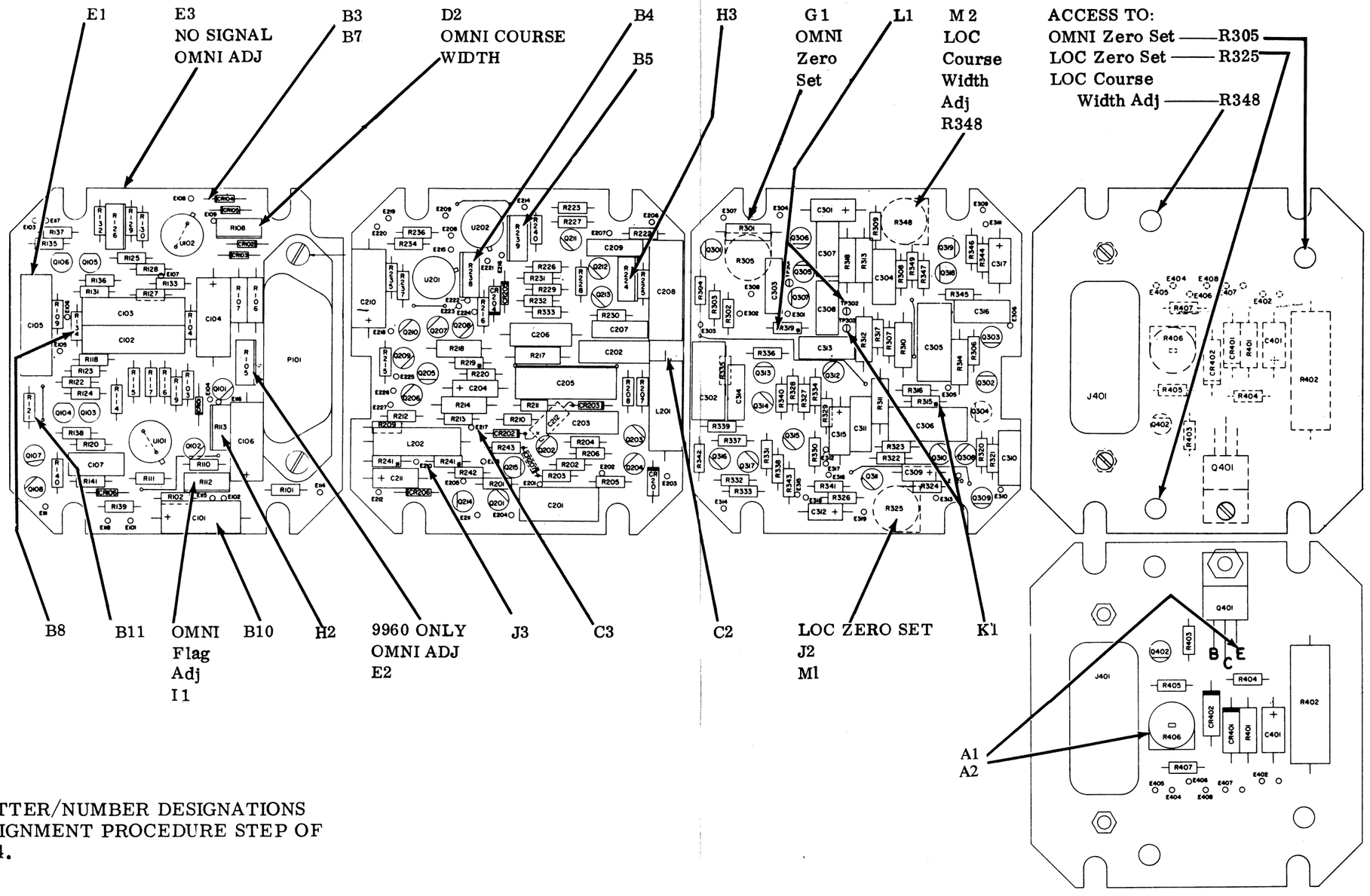
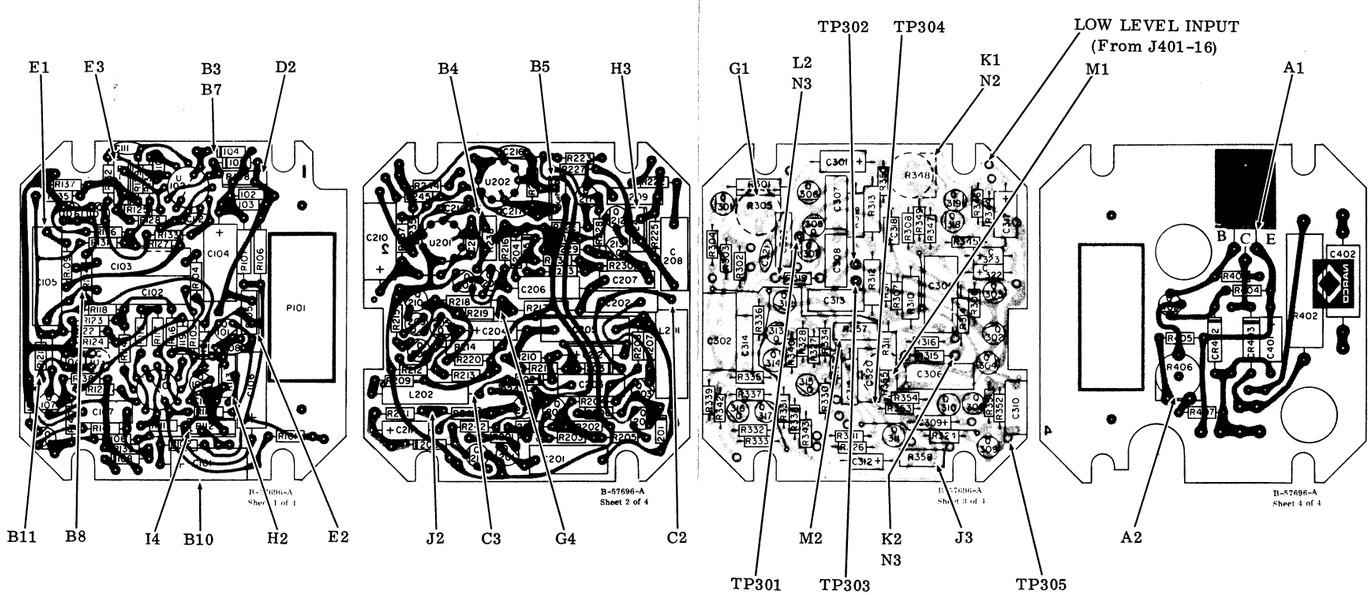


FIGURE 3.4-3A TSO'd OMNI MAINTENANCE INFORMATION



ARROWED LETTER/NUMBER DESIGNATIONS REFER TO ALIGNMENT PROCEDURE STEP OF SECTION 3.4.4.

FIGURE 3.4-4 ADJUSTMENT LOCATIONS FOR NON-TSO'd Models



ARROWED LETTER/NUMBER DESIGNATIONS REFER TO ALIGNMENT PROCEDURE STEP OF SECTION 3.4.4.

FIGURE 3.4-4A. ADJUSTMENT LOCATIONS FOR TSO'd MODELS

3.5 REPLACEMENT PARTS LIST

USED ON . . .

The column entitled "Used On" is used in this manual to indicate a change, addition, or deletion of a part as well as to identify parts of the Non-TSO'd Models vs the TSO'd Models.

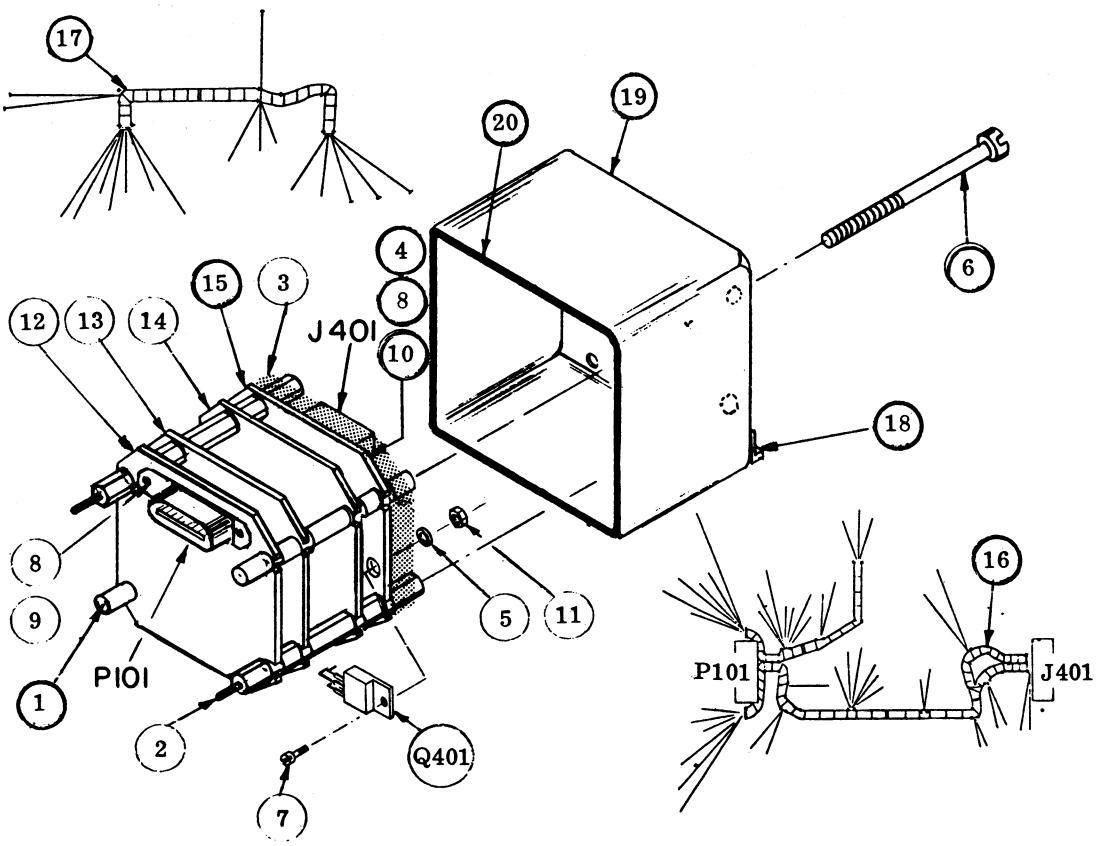
All parts without chassis number were first used on chassis CN208A for the Non-TSO'd Models and CNG219A for the TSO'd Models.

A dash (—) in this column indicates that the part is NOT used in that Model.

A deletion is shown: Deleted @ CN , and means that the part was used up to, but not including, that chassis number.

An addition is identified by a single symbol number entry with a chassis suffix "higher" than A.

A change is identified by repeating the item or symbol number of the changed part and the appropriate chassis number wherein the changed part was installed.



C-57449-A
C-57448-C

FIGURE 3.5-1 DGO 10 CONVERTER ASSY

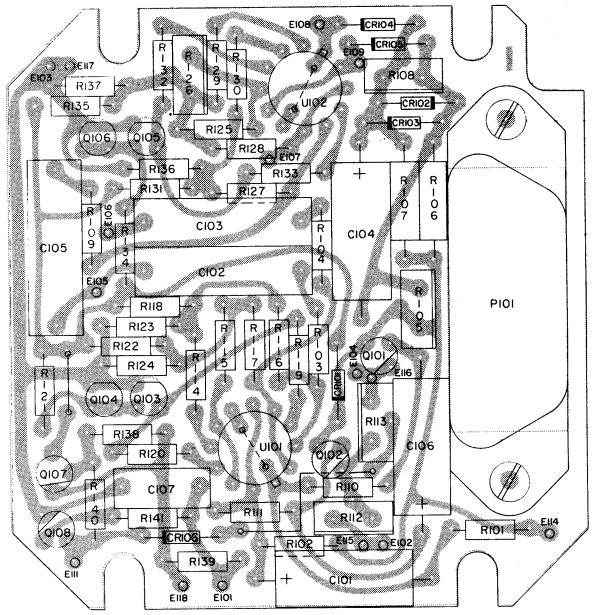
Item	Part Number	Description	Qty	USED ON Non-TSO'd Model CN208A	USED ON TSO'd Model CNG219A
LIST 1					
	01168-0101	DGO-10 CONVERTER ASSY (57449-0000) Non-TSO'd	1	.....	—
	01168-0102	DGO-10 CONVERTER ASSY (57696-0000) TSO'd	1	.... —	
1	81219-0001	STANDOFF, Tubing	2		
2	81220-0001	STANDOFF, HEX	2		
3	99068-0001	SHIELD, FOAM	1		
4	81324-0003	LOCKWASHER #3	2		
5	81324-0004	LOCKWASHER, #4	1		
6	82803-0022	SCREW, MACHINE, RD HD. SL. #4-40 x 3	2		
7	82892-0003	SCREW, MACHINE, PAM HD, SL, #4-40 x ¼	1		
8	82826-0004	SCREW, MACHINE, RD HD, SL, #3-48 x 5/16	4		
9	81275-0007	NUT, HEX, #3-48 (Elastic Stop)	2		
10	82900-0002	NUT, HEX, #3-48	2		
11	82900-0004	NUT, HEX, #4-40	1		
12	01168-0520	PRINTED CIRCUIT BOARD #1 ASSY (See List 2) Non-TSO'd	1	.....	—
12	01168-0520	PRINTED CIRCUIT BOARD #1 ASSY (See List 2) TSO'd	1	.... —	
13	01168-0220	PRINTED CIRCUIT BOARD #2 ASSY (See List 3) Non-TSO'd	1	.....	—
13	01168-0220	PRINTED CIRCUIT BOARD #2 ASSY (See List 3) TSO'd	1	.... —	
14	01168-0720	PRINTED CIRCUIT BOARD #3 ASSY (See List 4) Non-TSO'd	1	.....	—
14	01168-0720	PRINTED CIRCUIT BOARD #3 ASSY (See List 4) TSO'd	1	.... —	
15	01168-0800	PRINTED CIRCUIT BOARD #4 ASSY (See List 5) Non-TSO'd	1	.....	—
15	01168-0800	PRINTED CIRCUIT BOARD #4 ASSY (See List 5) TSO'd	1	.... —	
16	01168-0120	CABLE ASSY with P101 and J401	1		
17	01168-0430	INTERCONNECT CABLE	1		
18		BRACKET, SUPPORT	1		
19	57673-0002	CONVERTER CASE	1		
20	57683-0001	GASKET	1		

COMPONENT LOCATION

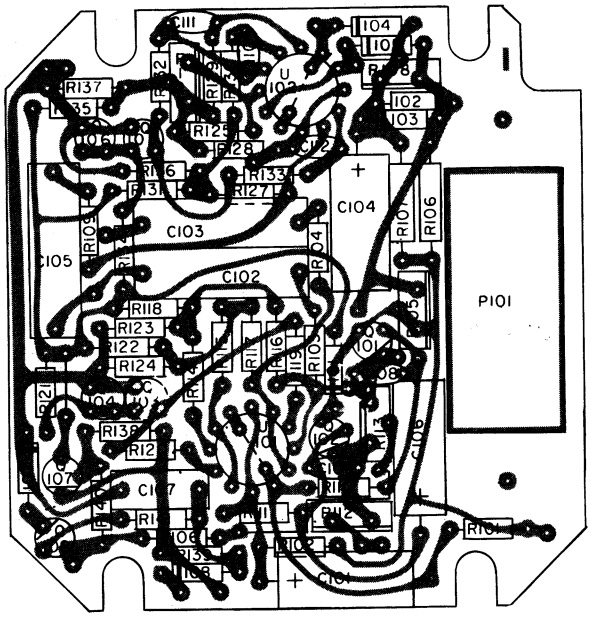
NON-TSO'd

TSO'd

COMPONENTS LOCATED ON OTHER SIDE:
C108
C109
C110
C111
C112



C-57449-A
SHEET 1

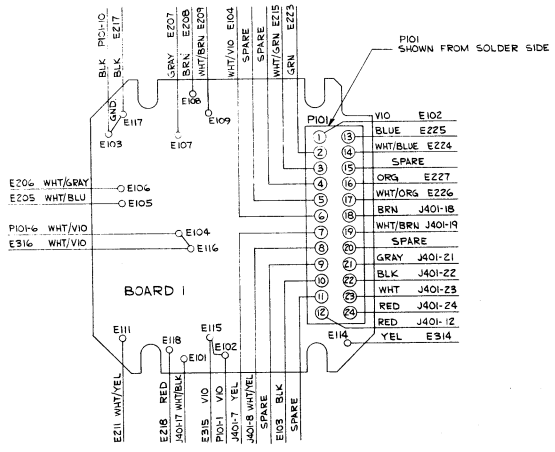


B-57696-A
Sheet 1 of 4

NON-TSO'd

INTERCONNECT WIRING

TSO'd



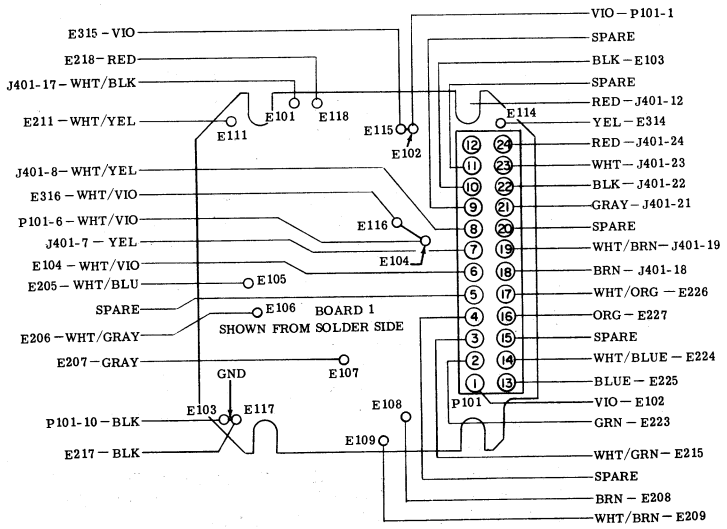


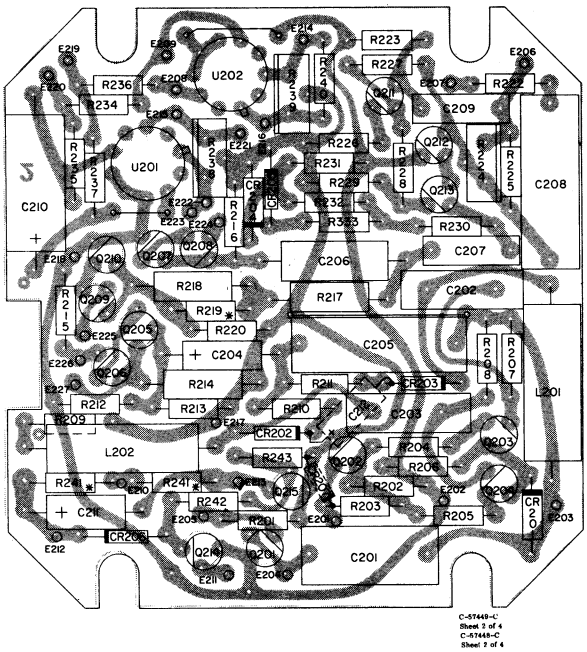
FIGURE 3.5-2 PRINTED CIRCUIT BOARD #1 ASSY

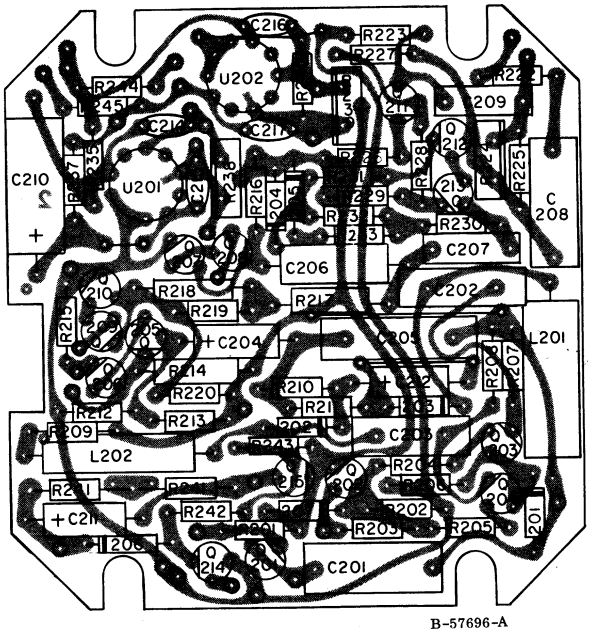
			USED ON	
			Non-TSO'd Model CN208A	TSO'd Model CNG219A
LIST 2	01168-0520	PRINTED CIRCUIT BOARD #1 ASSY (See List 1 for NHA) Non-TSO'd		—
	01168-	PRINTED CIRCUIT BOARD #1 ASSY (See List 1 for NHA) TSO'd	—	
C101	21554-0048	CAPACITOR, ELECTROLYTIC, 3.0 mf, 3V, NP		
C102	23094-0181	CAPACITOR, MYLAR, METALIZED, .33 mf ±10%, 200V		
C103	23094-0181	CAPACITOR, MYLAR, METALIZED, .33 mf, ±10%, 200V		
C104	21554-0048	CAPACITOR, ELECTROLYTIC, 3.0 mf, 3V, NP		
C105	23094-0083	CAPACITOR, MYLAR, METALIZED, .47 mf ±10%, 100V		
C106	21554-0049	CAPACITOR, ELECTROLYTIC, 5.0 mf, 3V, NP		
C107	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C108	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10% 500V	CN208A3	
C109	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10% 500V	CN208A3	
C110	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10% 500V	CN208A3	
C111	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10% 500V	CN208A3	
C112	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10%, 500V		
CR101	75028-0001	DIODE, SILICON		
CR102	75028-0001	DIODE, SILICON		
CR103	75028-0001	DIODE, SILICON		
CR104	75028-0003	DIODE, SILICON; MATCHED PAIR OF 75028-0001		
CR105	75028-0003	DIODE, SILICON; MATCHED PAIR OF 75028-0001		
CR106	75028-0001	DIODE, SILICON		
P101	41286-0003	CONNECTOR		
Q101	75587-0012	TRANSISTOR, SILICON, NPN, 2N5306		
Q102	75587-0012	TRANSISTOR, SILICON, NPN, 2N5306		
Q103	75557-0006	TRANSISTOR, SILICON, NPN		
Q104	75557-0006	TRANSISTOR, SILICON, NPN		
Q105	75557-0006	TRANSISTOR, SILICON, NPN		
Q106	75557-0006	TRANSISTOR, SILICON, NPN		
Q107	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q108	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
R101	31199-0261	RESISTOR, METAL FILM, 4.22K ±1%, ¼W		
R102	31199-0261	RESISTOR, METAL FILM, 4.22K ±1%, ¼W		
R103	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R104	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R105	32054-0015	RESISTOR, VARIABLE, 220K ±20%		
R106	31199-0261	RESISTOR, METAL FILM, 4.22K ±1%, ¼W		
R107	31199-0259	RESISTOR, METAL FILM, 4.02K ±1%, ¼W		
R108	32054-0021	RESISTOR, VARIABLE, 220K ±20%		
R109	31192-0822	RESISTOR, CARBON COMP, 8.2K ±10%, ¼W		
R110	31192-0473	RESISTOR, CARBON COMP, 47K ±10%, ¼W		
R111	31192-0473	RESISTOR, CARBON COMP, 47K ±10%, ¼W		
R112	32054-0025	RESISTOR, VARIABLE, 2.2K ±20%		
R113	32054-0003	RESISTOR, VARIABLE, 4.7K ±20%		
R114	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R115	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R116	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R117	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R118	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R119	31192-0680	RESISTOR, CARBON COMP, 68 ±10%, ¼W		
R120	31192-0680	RESISTOR, CARBON COMP, 68 ±10%, ¼W		
R121	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R122	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R123	31192-0392	RESISTOR, CARBON COMP, 3.9K ±10%, ¼W		
R124	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R125	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R126	32054-0021	RESISTOR, VARIABLE, 22K ±20%		
R127	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R128	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R129	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R130	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R131	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R132	31192-0680	RESISTOR, CARBON COMP, 68 ±10%, ¼W		
R133	31192-0680	RESISTOR, CARBON COMP, 68 ±10%, ¼W		
R134	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R135	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R136	31192-0392	RESISTOR, CARBON COMP, 3.9K ±10%, ¼W		
R137	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R138	31192-0682	RESISTOR, CARBON COMP, 6.8K ±10%, ¼W		
R139	31192-0473	RESISTOR, CARBON COMP, 47K ±10%, ¼W		
R140	31192-0562	RESISTOR, CARBON COMP, 5.6K ±10%, ¼W		
R141	31192-0102	RESISTOR, CARBON COMP, 1K ±10%, ¼W		
U101	74012-0003	INTEGRATED CIRCUIT, CA3026		
U102	74012-0002	INTEGRATED CIRCUIT, CA3026		

NON-TSO'd

COMPONENT LOCATION

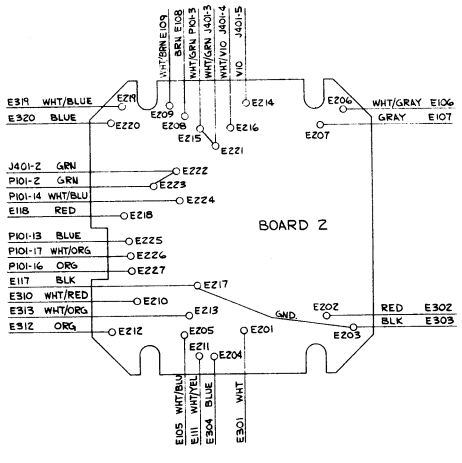
TSO'd





COMPONENTS LOCATED ON OTHER SIDE:
C214
C215
C216
C217

NON-TSO'd



TSO'd

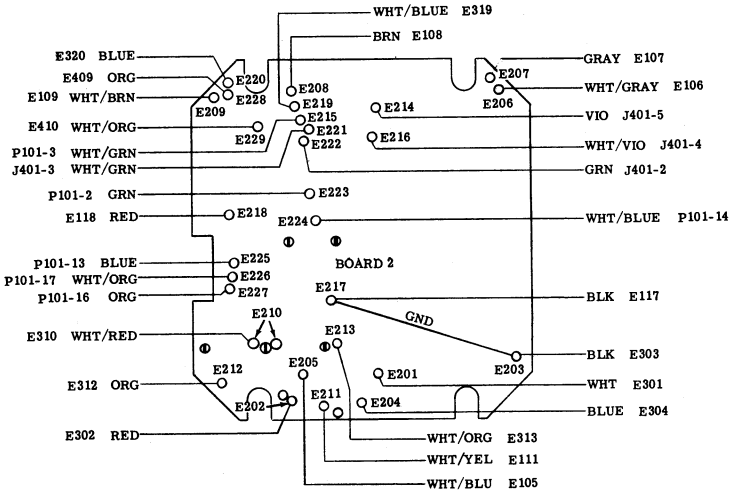
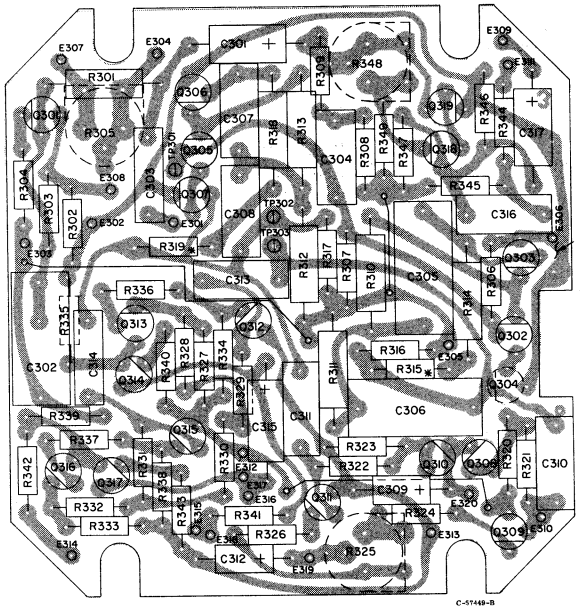


FIGURE 3.5-3. PRINTED CIRCUIT BOARD #2 ASSY

			USED ON	
			Non-TSO'd Model CN208A	TSO'd Model CNG219A
LIST 3	01168-0220	PRINTED CIRCUIT BOARD #2 Assy (See List 1 for NHA) Non-TSO'd		—
LIST 3	01168-	PRINTED CIRCUIT BOARD #2 Assy (See List 1 for NHA) TSO'd	—	
C201	23094-0179	CAPACITOR, MYLAR, METALIZED, 22 mf ±10%, 200V		
C202	24045-SEL	CAPACITOR, DIPPED MICA, SELECT ±5%, 300V		
C203	24045-SEL	CAPACITOR, DIPPED MICA, SELECT ±5%, 300V		
C204	21555-0018	CAPACITOR, TANTALUM, 22 mf ±10%, 15V		
C205	23094-0083	CAPACITOR, MYLAR, METALIZED, .47 mf ±10%, 100V		
C206	23100-0007	CAPACITOR, POLYCARBONATE, METAL, 0.1 mf ±10%, 100V		
C207	23094-0169	CAPACITOR, MYLAR, METALIZED .033 mf ±10%, 200V		
C208	23094-0083	CAPACITOR, MYLAR, METALIZED, .47 mf ±10%, 100V		
C209	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C210	21554-0050	CAPACITOR, ELECTROLYTIC 20 mf, 3V NP		
C211	21555-0018	CAPACITOR, TANTALUM, 22 mf ±10%, 15V		
C212	21555-0058	CAPACITOR, TANTALUM, 6.8 mf ±10%, 35V		
C214	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10%, 500V	CN208A3	
C215	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10%, 500V	CN208A3	
C216	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10%, 500V	CN208A3	
C217	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10%, 500V	CN208A3	
CR201	75027-0009	DIODE, ZENER, 6.8V ±5%		
CR202	75028-0001	DIODE, SILICON		
CR203	75028-0001	DIODE, SILICON		
CR204	75027-0004	DIODE, ZENER, 5.6V ±5%		
CR205	75028-0001	DIODE, SILICON		
CR206	75028-0001	DIODE, SILICON		
CR207	75027-0004	DIODE, ZENER, 5.6V ±5%		
L201	11360-0016	CHOKE, 150 mh ±10%		
L202	11360-0016	CHOKE, 150 mh ±10%		
Q201	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q202	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q203	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q204	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q205	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q206	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q207	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q208	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q209	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q210	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q211	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q212	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q213	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q214	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q215	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
R201	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R202	31192-0682	RESISTOR, CARBON COMP, 6.8K ±10%, ¼W		
R203	31192-0684	RESISTOR, CARBON COMP, 680K ±10%, ¼W		
R204	31192-0123	RESISTOR, CARBON COMP, 12K ±10%, ¼W		
R205	31192-0123	RESISTOR, CARBON COMP, 12K ±10%, ¼W		
R206	31192-0151	RESISTOR, CARBON COMP, 150 ±10%, ¼W		
R207	31192-0821	RESISTOR, CARBON COMP, 820 ±10%, ¼W		
R208	31192-0821	RESISTOR, CARBON COMP, 820 ±10%, ¼W		
R209	31192-0561	RESISTOR, CARBON COMP, 560 ±10%, ¼W		
R210	31192-0563	RESISTOR, CARBON COMP, 56K ±10%, ¼W		
R211	31192-0563	RESISTOR, CARBON COMP, 56K ±10%, ¼W		
R212	31192-0683	RESISTOR, CARBON COMP, 68K ±10%, ¼W		
R213	31192-0393	RESISTOR, CARBON COMP, 39K ±10%, ¼W		
R214	31199-0221	RESISTOR, METAL FILM, 1.62K ±1%, ¼W		
R215	31199-0221	RESISTOR, METAL FILM, 1.62K ±1%, ¼W		
R216	31192-0222	RESISTOR, CARBON COMP, 2.2K ±10%, ¼W		
R217	31199-0366	RESISTOR, METAL FILM, 47.5K ±1%, ¼W		
R218	31199-0301	RESISTOR, METAL FILM, 10K ±1%, ¼W		
R219	31192-SEL	RESISTOR, CARBON COMP, SELECT ±10%, ¼W		
R220	31192-0222	RESISTOR, CARBON COMP, 2.2K ±10%, ¼W		
R222	31192-0103	RESISTOR, CARBON COMP, 10K ±10%, ¼W		
R223	31192-0822	RESISTOR, CARBON COMP, 8.2K ±10%, ¼W		
R224	32054-0015	RESISTOR, VARIABLE, 220K ±20%		
R225	31192-0104	RESISTOR, CARBON COMP, 100K ±10%, ¼W		
R226	31192-0392	RESISTOR, CARBON COMP, 3.9K ±10%, ¼W		
R227	31192-0332	RESISTOR, CARBON COMP, 3.3K ±10%, ¼W		
R228	31192-0332	RESISTOR, CARBON COMP, 3.3K ±10%, ¼W		
R229	31192-0222	RESISTOR, CARBON COMP, 2.2K ±10%, ¼W		
R230	31192-0684	RESISTOR, CARBON COMP, 680K ±10%, ¼W		
R231	31192-0332	RESISTOR, CARBON COMP, 3.3K ±10%, ¼W		
R232	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R233	31192-0102	RESISTOR, CARBON COMP, 1K ±10%, ¼W		
R234	31192-0123	RESISTOR, CARBON COMP, 12K ±10%, ¼W		—
R235	31192-0153	RESISTOR, CARBON COMP, 15K ±10%, ¼W		
R236	31192-0123	RESISTOR, CARBON COMP, 12K ±10%, ¼W		—
R237	31192-0153	RESISTOR, CARBON COMP, 15K ±10%, ¼W		
R238	32054-0003	RESISTOR, VARIABLE, 4.7K ±20%		
R239	32054-0003	RESISTOR, VARIABLE, 4.7K ±20%		
R240	31192-0681	RESISTOR, CARBON COMP, 680 ±10%, ¼W		
R241	31192-SEL	RESISTOR, CARBON COMP, SEL. ±10%, ¼W		
R242	31192-0333	RESISTOR, CARBON COMP, 33K ±10%, ¼W		
R243	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R244	31192-0102	RESISTOR, CARBON COMP, 1K ±10%, ¼W	—	
R245	31192-0102	RESISTOR, CARBON COMP, 1K ±10%, ¼W	—	
U201	74013-0001	INTEGRATED CIRCUIT, CA3036		
U202	74013-0001	INTEGRATED CIRCUIT, CA3036		

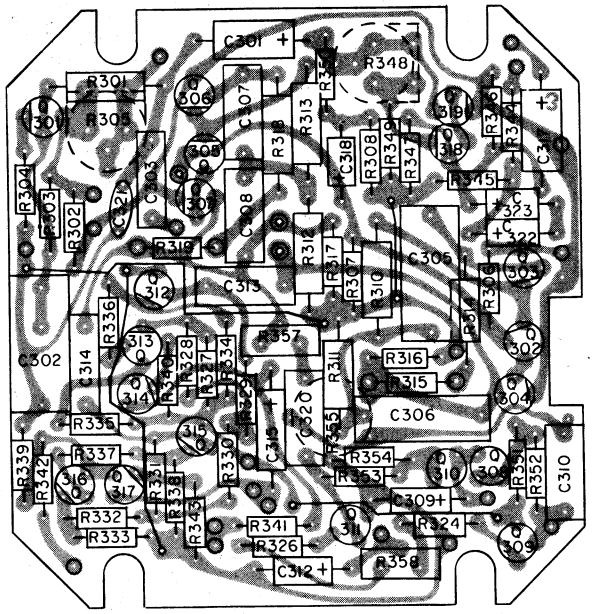
COMPONENT LOCATION

NON-TSO'd



COMPONENTS LOCATED ON OTHER SIDE:
C-321

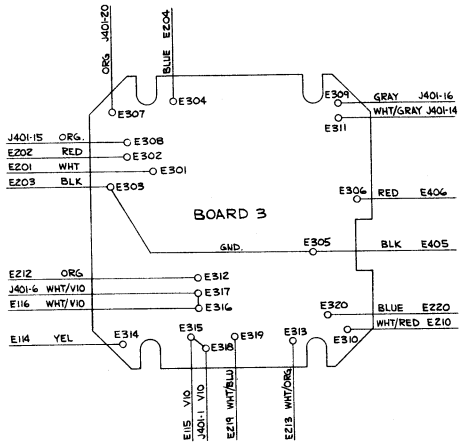
TSO'd



B-57696-A
Sheet 3 of 4

INTERCONNECT WIRING

NON-TSO' d



TSO' d

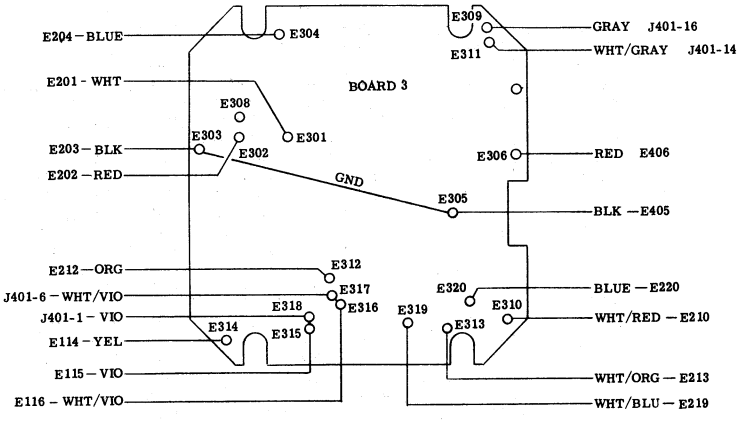
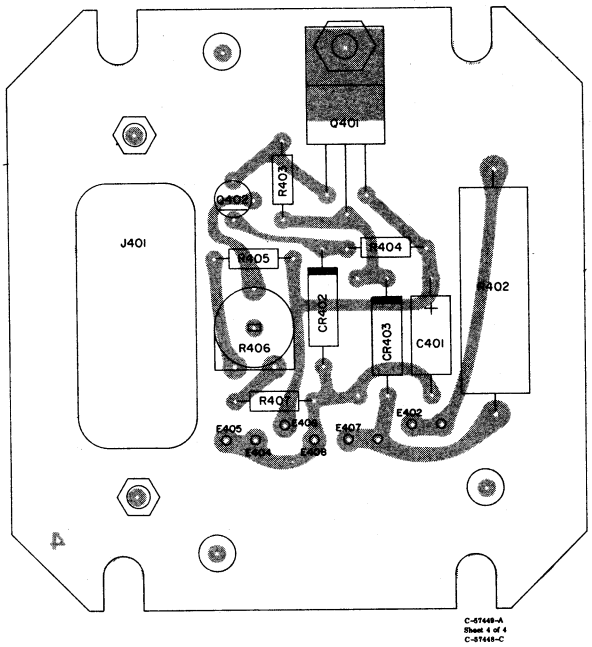


FIGURE 3.5-4 PRINTED CIRCUIT BOARD #3 ASSY

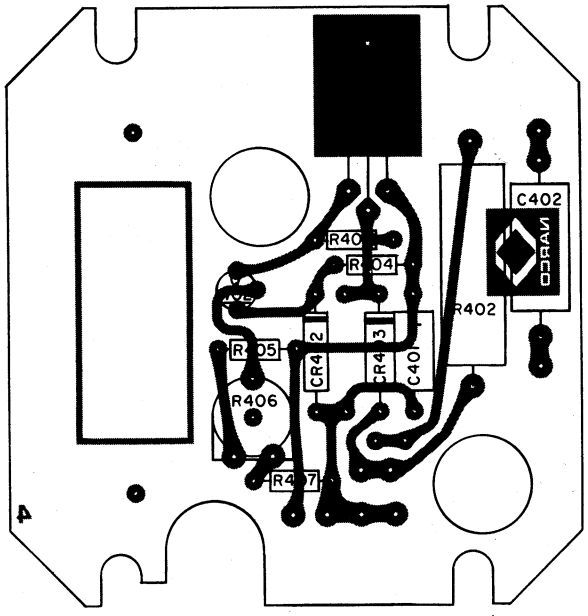
			USED ON	
			Non-TSO'd Model CN208A	TSO'd Model CNG219A
LIST 4	01168-0720	PRINTED CIRCUIT BOARD #3 ASSY (See List 1 for NHA) Non-TSO'd		—
	01168-	PRINTED CIRCUIT BOARD #3 ASSY (See List 1 for NHA) TSO'd	—	
C301	21555-0018	CAPACITOR, TANTALUM, 22 mf ±10%, 15V		
C302	23094-0177	CAPACITOR, MYLAR, METALIZED, 0.15 mf ±10%, 200V		
C303	23094-0155	CAPACITOR, MYLAR, METALIZED, .0022 mf ±10%, 200V		
C304	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		—
C305	23094-0177	CAPACITOR, MYLAR, METALIZED, .15 mf ±10%, 200V		
C306	23094-0177	CAPACITOR, MYLAR, METALIZED, .15 mf ±10%, 200V		
C307	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C308	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C309	21555-0016	CAPACITOR, TANTALUM, 3.3 mf ±10%, 15V		
C310	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C311	23094-0171	CAPACITOR, MYLAR, METALIZED, .047 mf ±10%, 200V		—
C312	21555-0016	CAPACITOR, TANTALUM, 3.3 mf ±10%, 15V		
C313	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C314	23094-0171	CAPACITOR, MYLAR, METALIZED, .047 mf ±10%, 200V		
C315	21555-0018	CAPACITOR, TANTALUM, 22 mf ±10%, 15V		
C316	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		—
C317	21555-0018	CAPACITOR, TANTALUM, 22 mf ±10%, 15V		
C318	21555-0016	CAPACITOR, TANTALUM, 3.3 mf ±10%, 15V		
C320	23094-0175	CAPACITOR, MYLAR, METALIZED, 0.1 mf ±10%, 200V		
C321	21291-0025	CAPACITOR, CERAMIC DISC, 430 pf ±10%, 500V		
C322	21555-0048	CAPACITOR, TANTALUM, 1.0 mf ±10%, 35V	—	
C323	21555-0048	CAPACITOR, TANTALUM, 1.0 mf ±10%, 35V	—	
Q301	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q302	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q303	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q304	75565-0003	TRANSISTOR, SILICON, PNP, 2N5356		
Q305	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q306	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q307	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q308	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q309	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q310	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q311	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q312	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q313	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q314	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q315	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q316	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
Q317	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q318	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
Q319	75565-0006	TRANSISTOR, SILICON, PNP, 2N5356		
R301	31199-0278	RESISTOR, METAL FILM, 6.34K ±1%, ¼W		
R302	31192-0682	RESISTOR, CARBON COMP, 6.8K ±10%, ¼W		
R303	31192-0684	RESISTOR, CARBON COMP, 680K ±10%, ¼W		
R304	31192-0182	RESISTOR, CARBON COMP, 1.8K ±10%, ¼W		
R304	31192-0152	RESISTOR, CARBON COMP, 1.5K ±10%, ¼W	CN208A3	
R305	32054-0058	RESISTOR, VARIABLE, 10K ±20%		
R305	32054-0072	RESISTOR, VARIABLE, 22K ±20%	CN208A3	
R306	31192-0473	RESISTOR, CARBON COMP, 47K ±10%, ¼W		
R307	31192-0473	RESISTOR, CARBON COMP, 47K ±10%, ¼W		
R308	31192-0153	RESISTOR, CARBON COMP, 15K ±10%, ¼W		
R309	31192-0153	RESISTOR, CARBON COMP, 15K ±10%, ¼W		
R310	31199-0278	RESISTOR, METAL FILM, 6.34K ±1%, ¼W		
R311	31199-0230	RESISTOR, METAL FILM, 2.0K ±1%, ¼W		
R312	31199-0226	RESISTOR, METAL FILM, 1.82K ±1%, ¼W		
R313	31199-0278	RESISTOR, METAL FILM, 6.34K ±1%, ¼W		
R314	31199-0385	RESISTOR, METAL FILM, 75K ±1%, ¼W		
R315	31192-SEL	RESISTOR, CARBON COMP. SELECT ±10%, ¼W		
R316	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R317	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R318	31199-0381	RESISTOR, METAL FILM, 68.1K ±1%, ¼W		
R319	31192-SEL	RESISTOR, CARBON COMP, SELECT ±10%, ¼W		
R320	31192-0332	RESISTOR, CARBON COMP, 3.3K ±10%, ¼W		—
R321	31192-0123	RESISTOR, CARBON COMP, 12K ±10%, ¼W		—
R322	31192-0123	RESISTOR, CARBON COMP, 12K ±10%, ¼W		—
R323	31192-0332	RESISTOR, CARBON COMP, 3.3K ±10%, ¼W		—
R324	31199-0226	RESISTOR, METAL FILM, 1.82K ±1%, ¼W		
R325	32054-0052	RESISTOR, VARIABLE, 470 ±20%		—
R326	31199-0221	RESISTOR, METAL FILM, 1.62K ±1%, ¼W		
R327	31192-0182	RESISTOR, CARBON COMP, 1.8K ±10%, ¼W		
R328	31192-0471	RESISTOR, CARBON COMP, 470 ±10%, ¼W		
R329	31192-0104	RESISTOR, CARBON COMP, 100K ±10%, ¼W		
R330	31192-0181	RESISTOR, CARBON COMP, 180 ±10%, ¼W		
R331	31192-0104	RESISTOR, CARBON COMP, 100K ±10%, ¼W		
R332	31192-0471	RESISTOR, CARBON COMP, 470 ±10%, ¼W		
R333	31192-0182	RESISTOR, CARBON COMP, 1.8K ±10%, ¼W		
R343	31192-0680	RESISTOR, CARBON COMP, 68 ±10%, ¼W		
R344	31192-0684	RESISTOR, CARBON COMP, 680K ±10%, ¼W		
R345	31192-0154	RESISTOR, CARBON COMP, 150K ±10%, ¼W		
R346	31192-0394	RESISTOR, CARBON COMP, 390K ±10%, ¼W		
R347	31192-0124	RESISTOR, CARBON COMP, 120K ±10%, ¼W		
R348	32054-0054	RESISTOR, VARIABLE, 4.7K ±20%		
R349	31192-0472	RESISTOR, CARBON COMP, 4.7K ±10%, ¼W		
R350	31192-0333	RESISTOR, CARBON COMP, 33K ±10%, ¼W		
R351	31195-0332	RESISTOR, CARBON COMP, 3.3K ±5%, ¼W		
R352	31195-0153	RESISTOR, CARBON COMP, 15K ±5%, ¼W		
R353	31195-0153	RESISTOR, CARBON COMP, 15K ±5%, ¼W		
R354	31195-0332	RESISTOR, CARBON COMP, 3.3K ±5%, ¼W		
R355	32054-0072	RESISTOR, VARIABLE, 22K ±20%		
R357	32054-0021	RESISTOR, VARIABLE, 22K ±20%		
R358	32054-0001	RESISTOR, VARIABLE, 470 ±20%		

COMPONENT LOCATION

NON-TSO'd



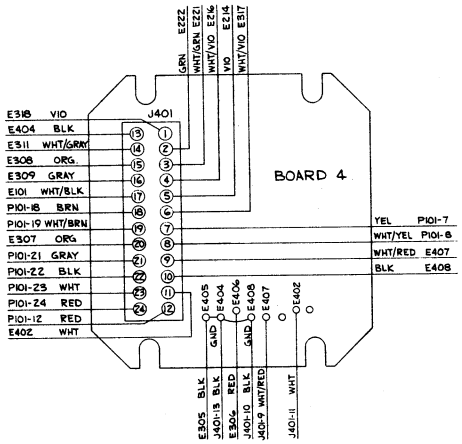
TSO'd



C-57449-A
C-57448-C

INTERCONNECT WIRING

NON-TSO'd



TSO'd

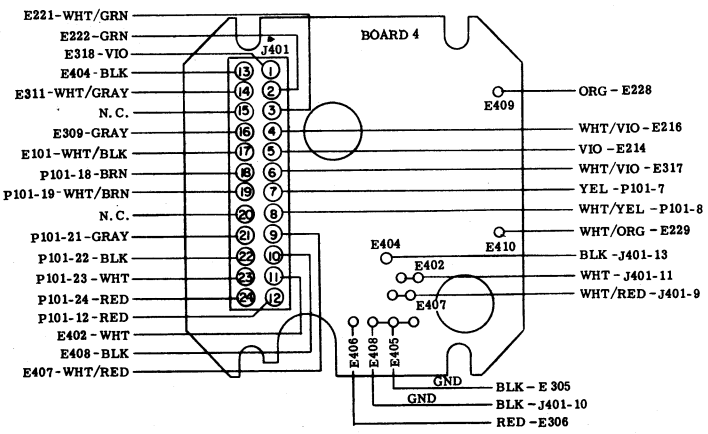
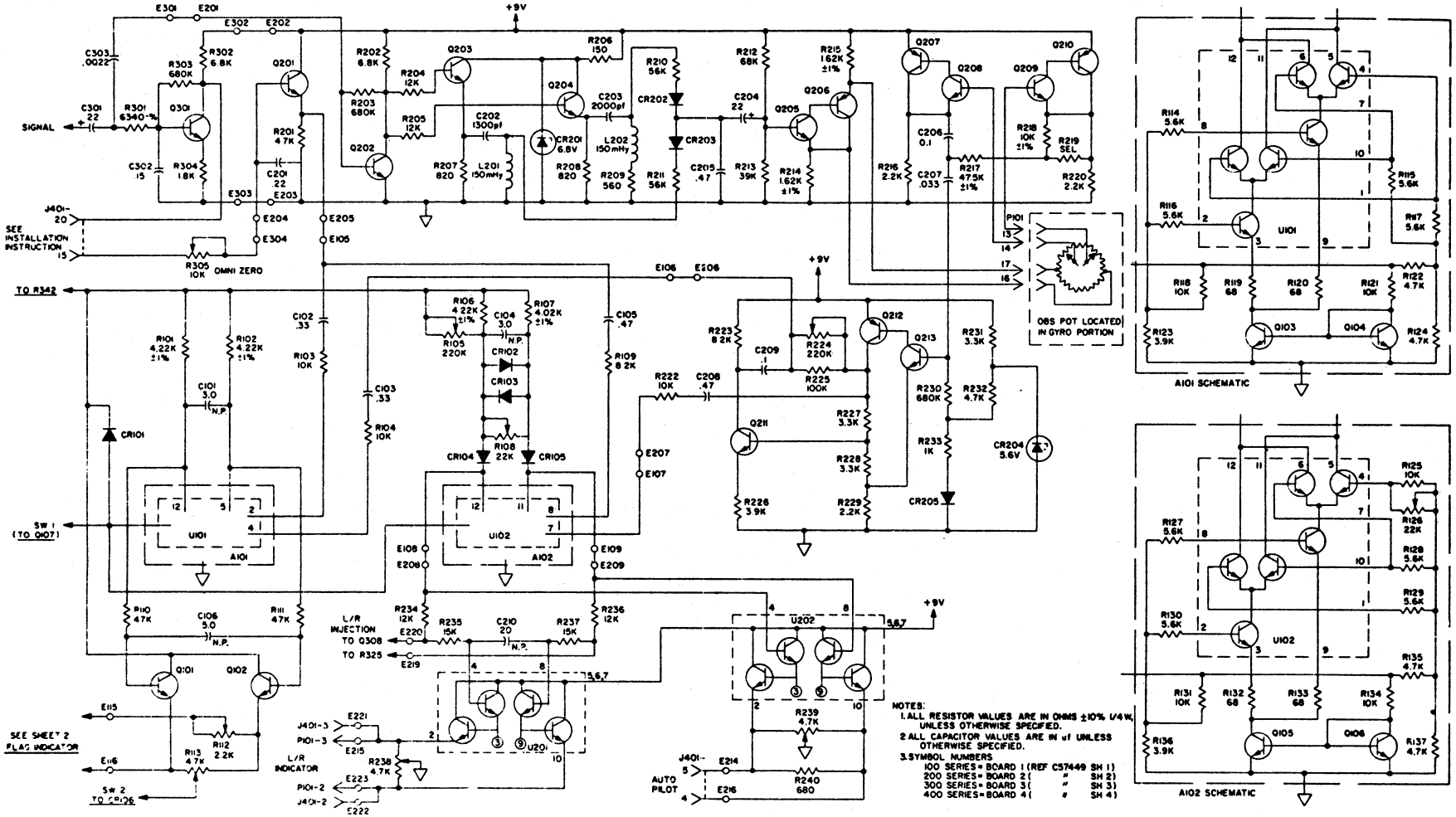


FIGURE 3.5-5 PRINTED CIRCUIT BOARD #4 ASSY

			USED ON	
			Non-TSO'd Model CN208A	TSO'd Model CNG219A
LIST 5	01168-0800	PRINTED CIRCUIT BOARD #4 ASSY (See List 1 for NHA) Non-TSO'd	—	
	01168-0800	PRINTED CIRCUIT BOARD #4 ASSY (See List 1 for NHA) TSO'd		—
C401	01168-0800	CAPACITOR, TANTALUM, 22 mf ±10%, 15V	Deleted @ CN208A3	—
C402	21554-0050	CAPACITOR, ELECTROLYTIC, 20 mf, 3V NP	—	
CR401	75025-0009	DIODE, ZENER, 18V		
CR402	75027-0004	DIODE, ZENER, 5.6V ±5%		
CR403	75204-0045	DIODE, SILICON	CN208A3	
J401	41285-0005	CONNECTOR		
Q401	75576-0001	TRANSISTOR, SILICON, NPN, 2N5494		
Q402	75595-0003	TRANSISTOR, SILICON, NPN, 2N5172		
R401	31141-0109	RESISTOR, CARBON COMP, 1.0 ±10%, ½W	Deleted @ CN208A3	—
R402	31162-0013	RESISTOR, WIREWOUND, 220, 5W		
R403	31192-0681	RESISTOR, CARBON COMP, 680 ±10%, ¼W		
R404	31192-0271	RESISTOR, CARBON COMP, 270 ±10%, ¼W		
R405	31192-0102	RESISTOR, CARBON COMP, 1K ±10%, ¼W		
R406	32054-0002	RESISTOR, VARIABLE, 470		
R407	31192-0272	RESISTOR, CARBON COMP, 2.7K ±10%, ¼W		



D-02326-A
SHEET 1 of 2

FIGURE 3.6-1 DGO 10 SCHEMATIC, OMNI SECTION (Sheet 1 of 2), CN208A and A1 (Non-TSO'd Models)

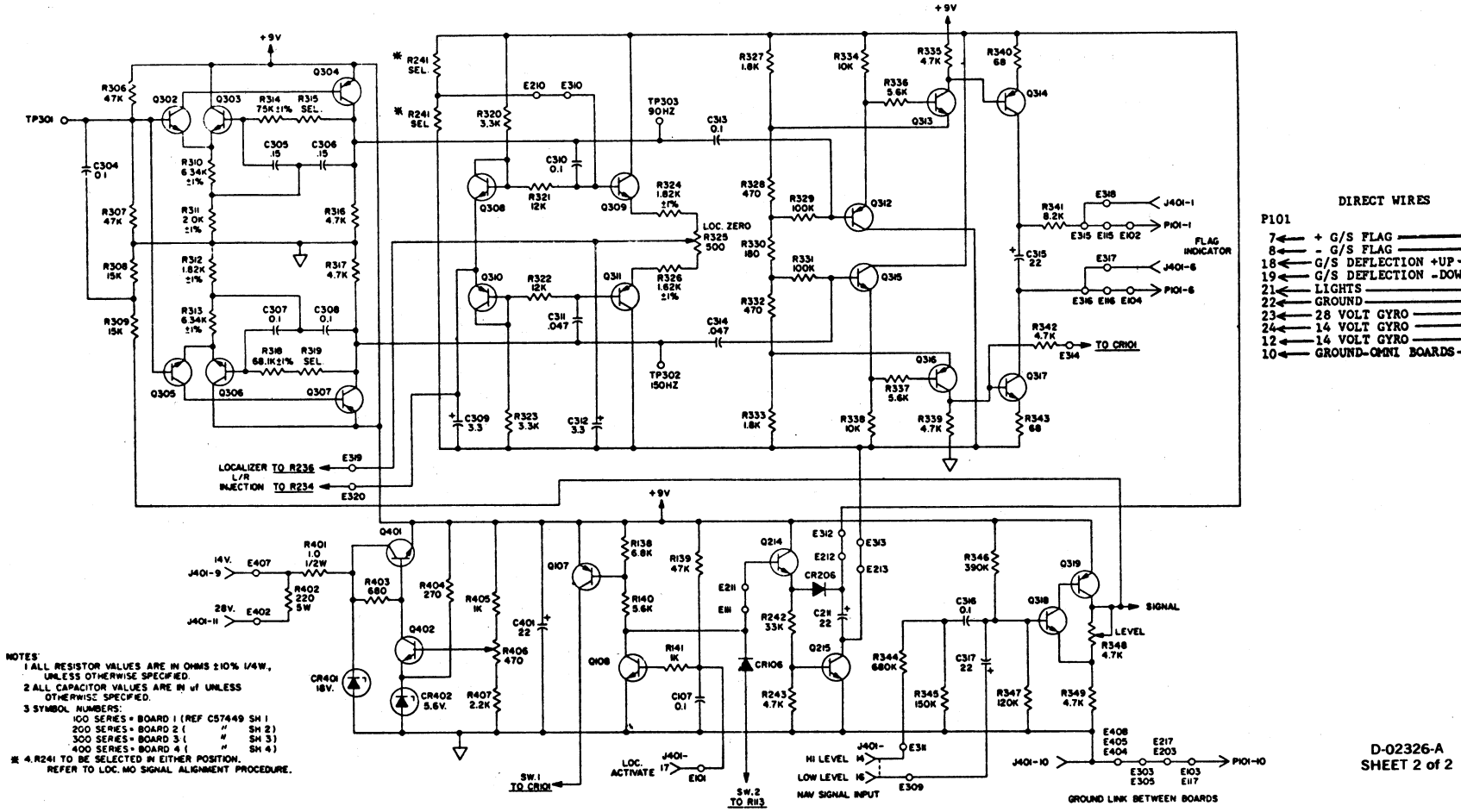

+9V
TP301
TP303 90HZ
TP302 150HZ
LOC. ZERO R325 500
FLAG INDICATOR
TO CR101
LOCALIZER TO R236
L/R INJECTION TO R234
SW.1 TO CR101
LOC. ACTIVATE
SW.2 TO RH3
HI LEVEL
LOW LEVEL
NAV SIGNAL INPUT
SIGNAL
LEVEL
GROUND LINK BETWEEN BOARDS
DIRECT WIRES
P101
J401
7 ← + G/S FLAG — 7
8 ← - G/S FLAG — 8
18 ← G/S DEFLECTION +UP — 18
19 ← G/S DEFLECTION -DOWN — 19
21 ← LIGHTS — 21
22 ← GROUND — 22
23 ← 28 VOLT GYRO — 23
24 ← 14 VOLT GYRO — 24
12 ← 14 VOLT GYRO — 12
10 ← GROUND-OMNI BOARDS — 10
NOTES:
1 ALL RESISTOR VALUES ARE IN OHMS ±10% 1/4W, UNLESS OTHERWISE SPECIFIED.
2 ALL CAPACITOR VALUES ARE IN uf UNLESS OTHERWISE SPECIFIED.
3 SYMBOL NUMBERS:
100 SERIES = BOARD 1 (REF CS7449 SH 1
200 SERIES = BOARD 2 (" SH 2)
300 SERIES = BOARD 3 (" SH 3)
400 SERIES = BOARD 4 (" SH 4)
* 4. R241 TO BE SELECTED IN EITHER POSITION. REFER TO LOC. MO SIGNAL ALIGNMENT PROCEDURE.
D-02326-A
SHEET 2 of 2

FIGURE 3.6-1 DGO 10 SCHEMATIC, LOCALIZER SECTION (Sheet 2 of 2), CN208A and A1 (Non-TSO'd Models)

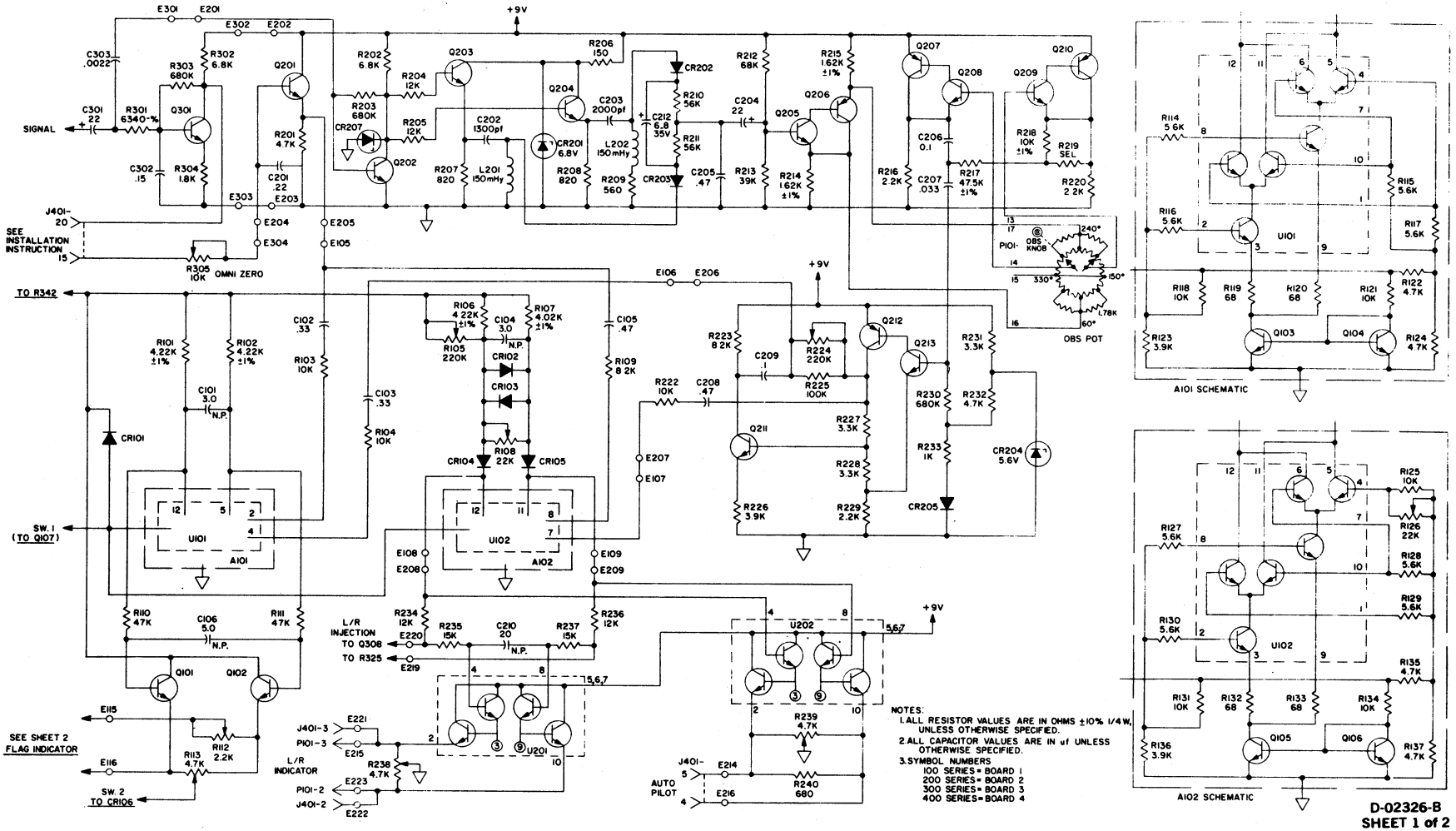
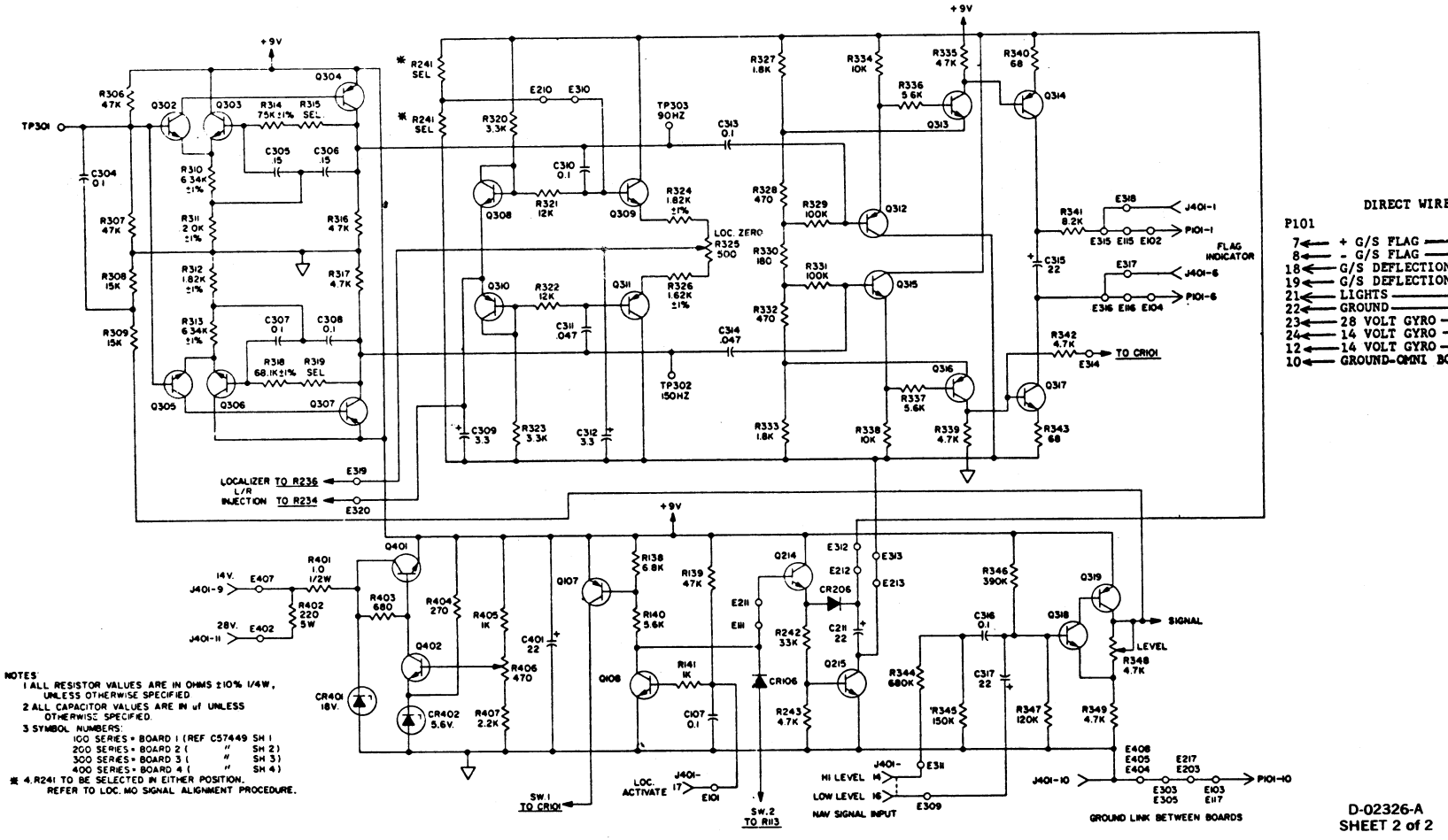
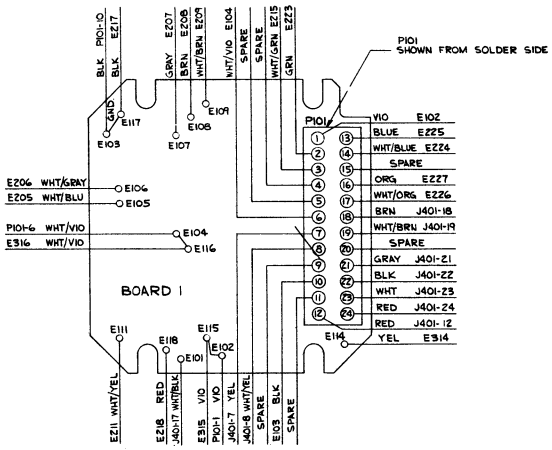


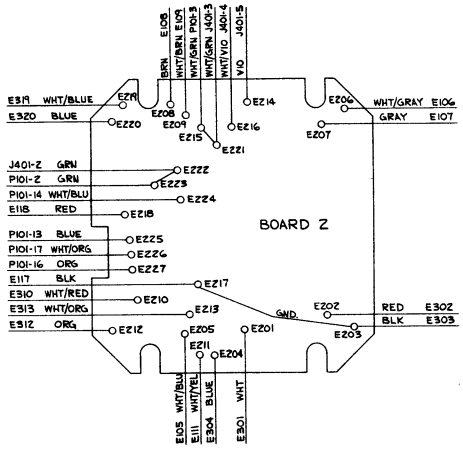
FIGURE 3.6-2 DGO 10 SCHEMATIC, OMNI SECTION (Sheet 1 of 2)
CN208A2 (Non-Tso'd Models)


DIRECT WIRES
P101 J401
7 + G/S FLAG 7
8 - G/S FLAG 8
18 G/S DEFLECTION +UP 18
19 G/S DEFLECTION -DOWN 19
21 LIGHTS 21
22 GROUND 22
23 28 VOLT GYRO 23
24 14 VOLT GYRO 24
12 14 VOLT GYRO 12
10 GROUND-OMNI BOARDS 10
FLAG INDICATOR
TO CR101
LOCALIZER TO R236
L/R INJECTION TO R234
SIGNAL
LEVEL
SW.1 TO CR101
SW.2 TO R113
LOC. ACTIVATE
HI LEVEL
LOW LEVEL
NAV SIGNAL INPUT
GROUND LINK BETWEEN BOARDS
NOTES:
1 ALL RESISTOR VALUES ARE IN OHMS ±10% 1/4W, UNLESS OTHERWISE SPECIFIED
2 ALL CAPACITOR VALUES ARE IN uf UNLESS OTHERWISE SPECIFIED.
3 SYMBOL NUMBERS:
100 SERIES = BOARD 1 (REF C57449 SH 1
200 SERIES = BOARD 2 (" SH 2)
300 SERIES = BOARD 3 (" SH 3)
400 SERIES = BOARD 4 (" SH 4)
* 4.R241 TO BE SELECTED IN EITHER POSITION. REFER TO LOC. MO SIGNAL ALIGNMENT PROCEDURE.

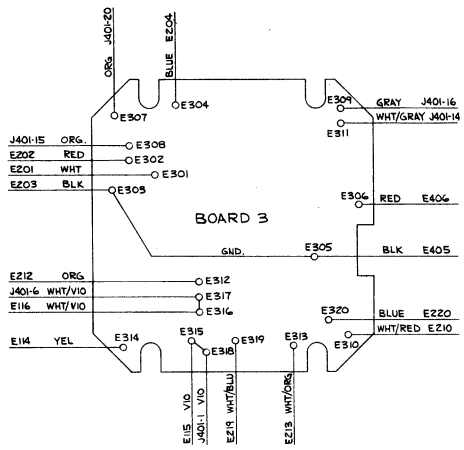
D-02326-A
SHEET 2 of 2

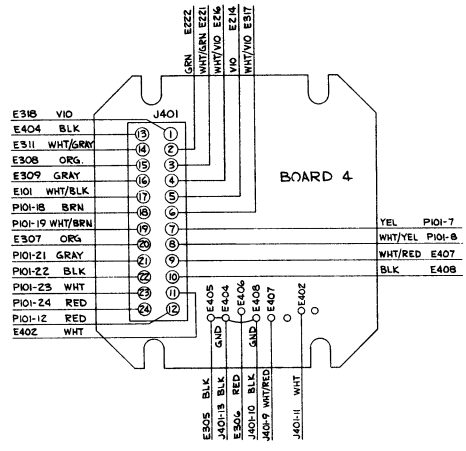
FIGURE 3.6-2 DGO 10 SCHEMATIC, LOCALIZER SECTION (Sheet 2 of 2) CN208A2 (NON - TSO'D MODELS)

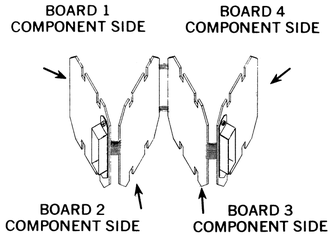


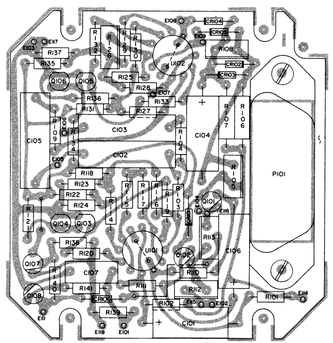


FOR Non-TSO'd Models

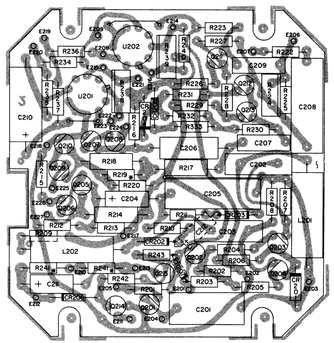








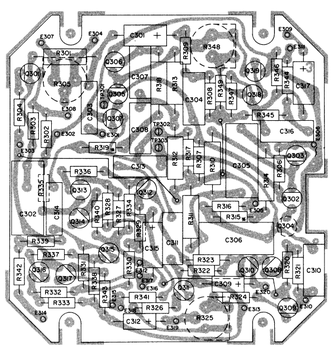
BOARD 1



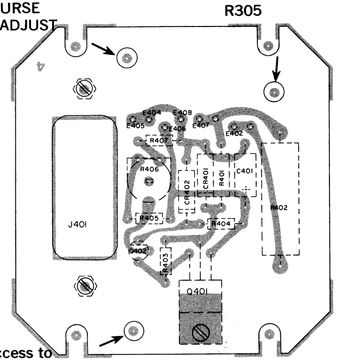
BOARD 2

Access to
OMNI ZERO SET
R305

Access to
LOC COURSE
WIDTH ADJUST
R348



BOARD 3



Access to
LOC ZERO SET
R325

BOARD 4

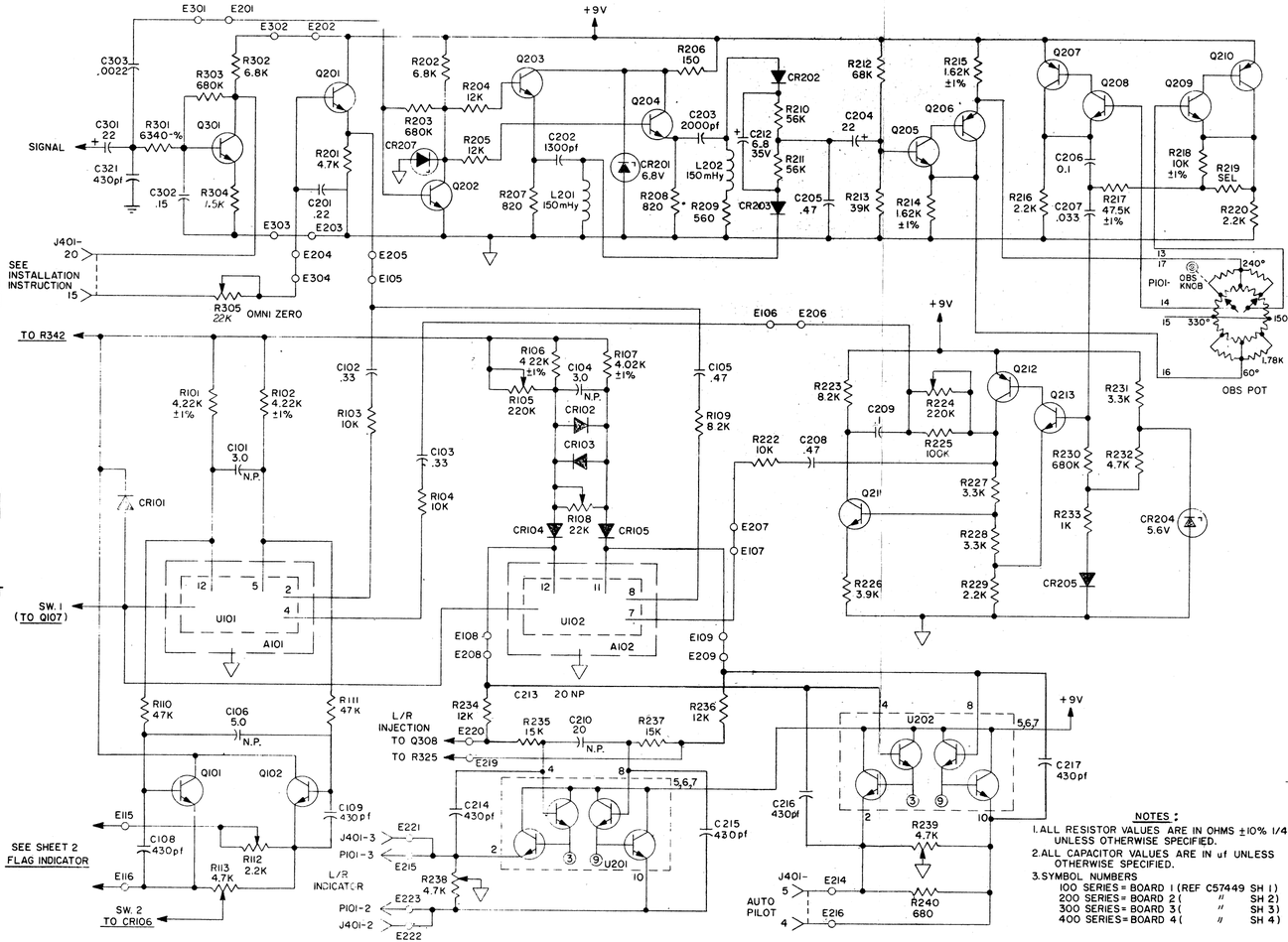
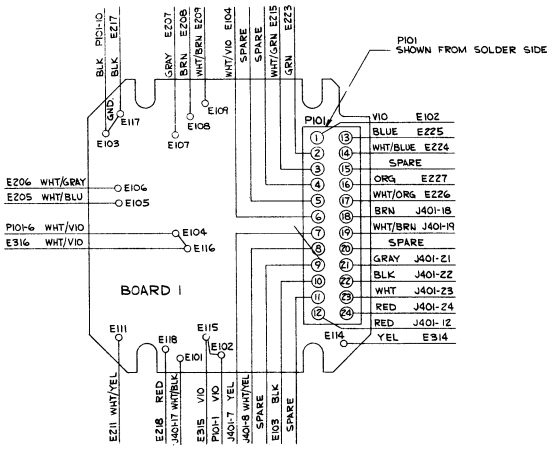
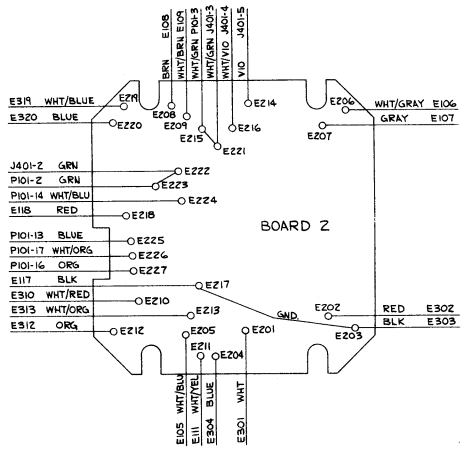
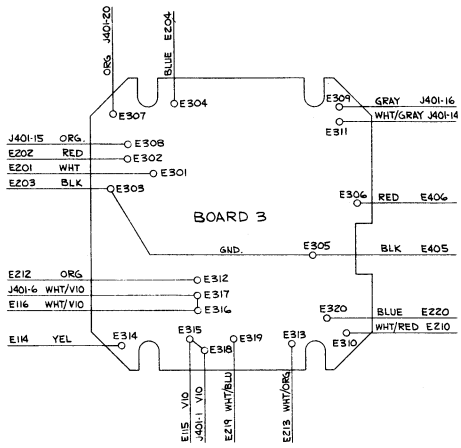


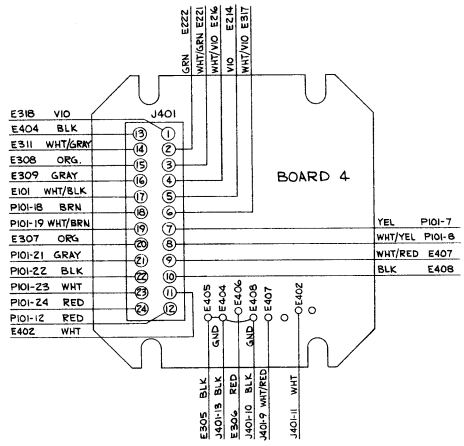
FIGURE 3.6-3. DGO 10 OMNI, Schematic (Sheet 1 of 2) CN208A3 and Later (Non-TSO'd Models)

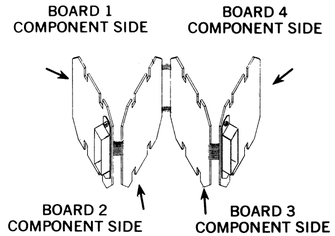


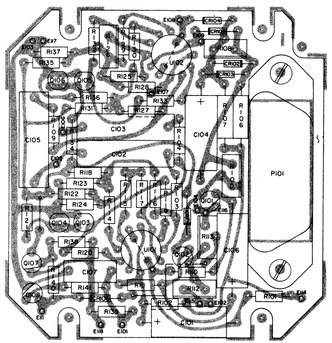


FOR NON-TSO'D MODELS

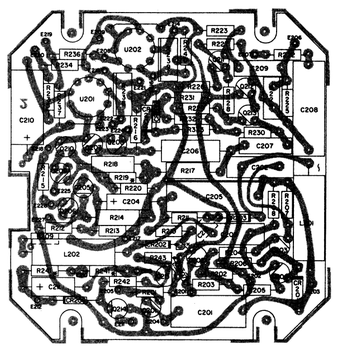






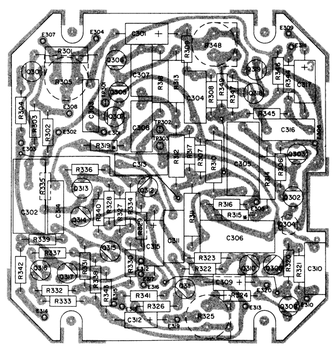


BOARD 1



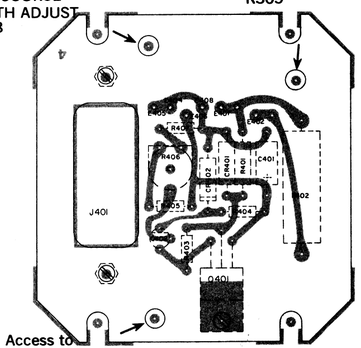
BOARD 2

Access to
OMNI ZERO SET
R305



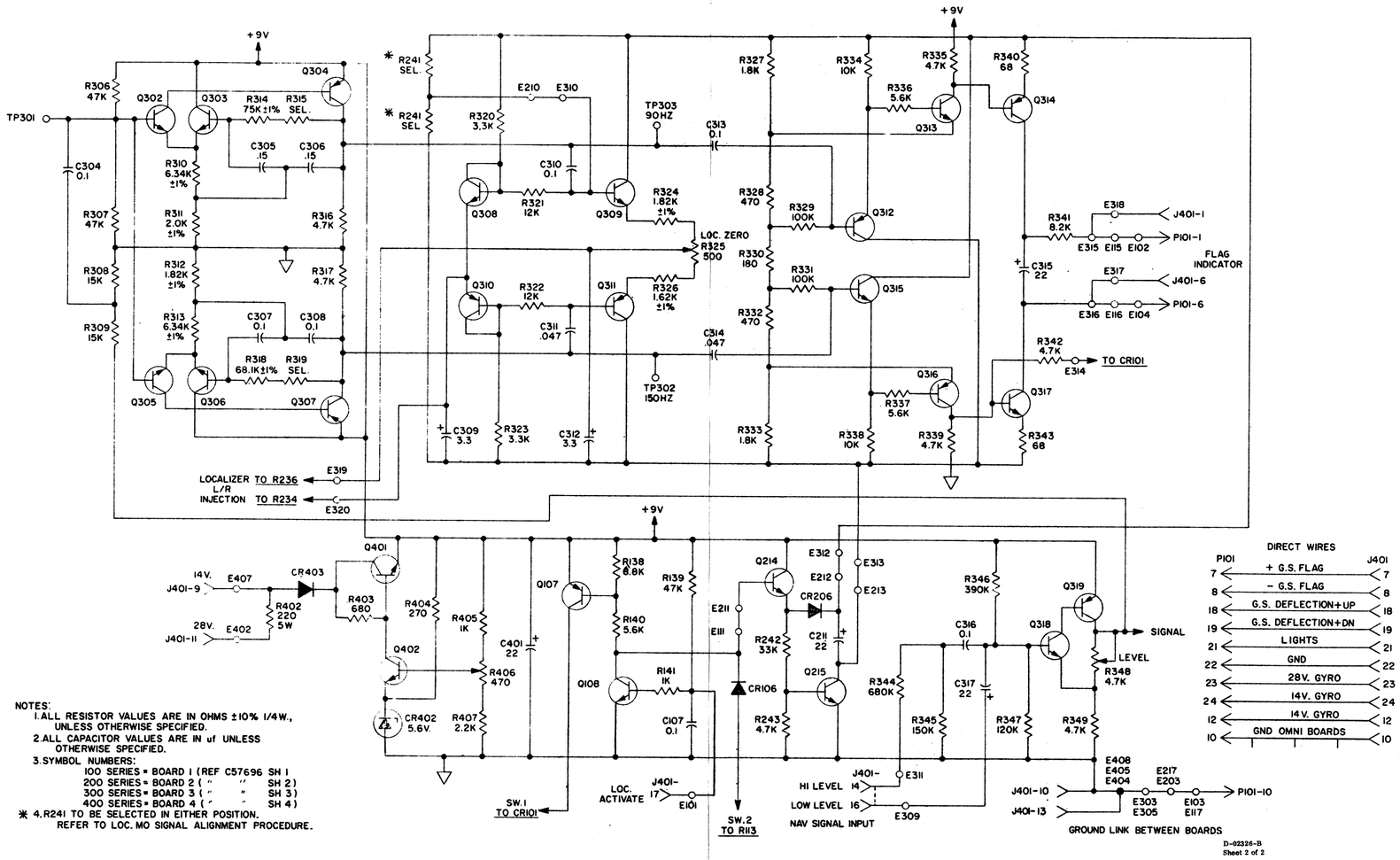
BOARD 3

Access to
LOC COURSE
WIDTH ADJUST
R348



Access to
LOC ZERO SET
R325

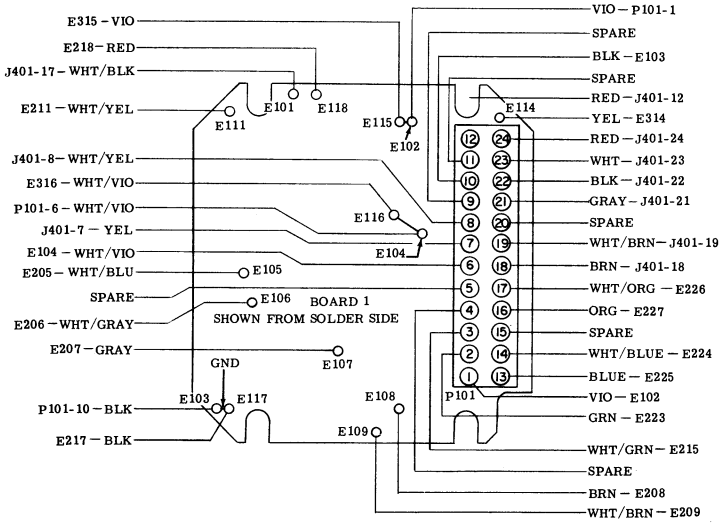
BOARD 4

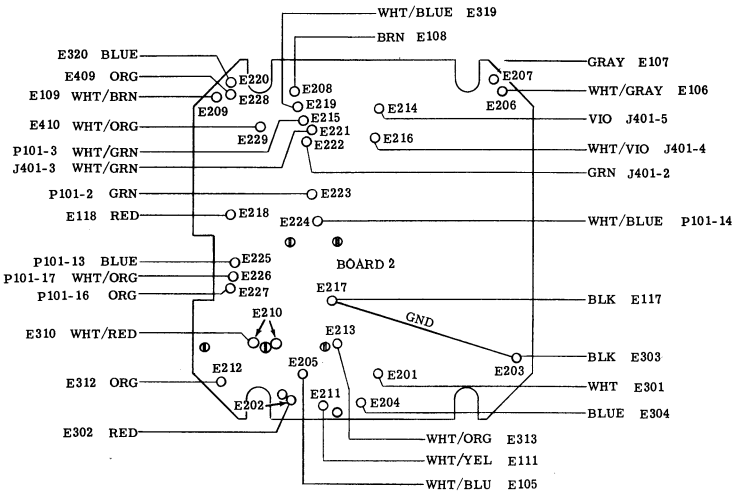


NOTES:
1. ALL RESISTOR VALUES ARE IN OHMS ±10% 1/4W., UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN uf UNLESS OTHERWISE SPECIFIED.
3. SYMBOL NUMBERS:
   100 SERIES = BOARD 1 (REF C57696 SH 1
   200 SERIES = BOARD 2 (" " SH 2)
   300 SERIES = BOARD 3 (" " SH 3)
   400 SERIES = BOARD 4 (" " SH 4)
* 4. R241 TO BE SELECTED IN EITHER POSITION. REFER TO LOC. MO SIGNAL ALIGNMENT PROCEDURE.

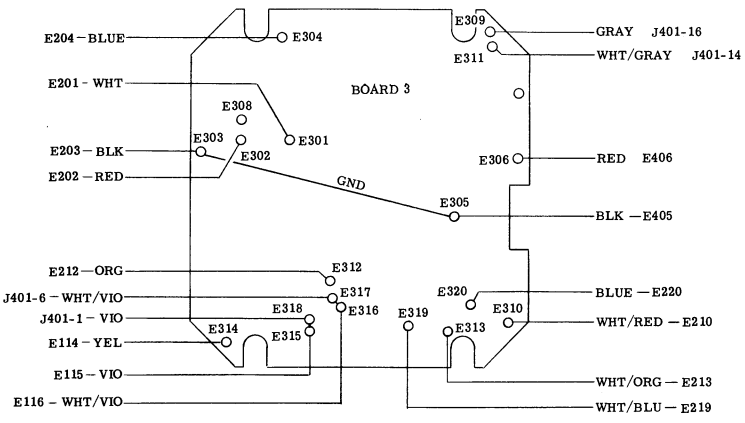
FIGURE 3.6-3. DGO 10 Localizer Schematic (Sheet 2 of 2) CN208A3 and Later (Non-TSO'd Models)

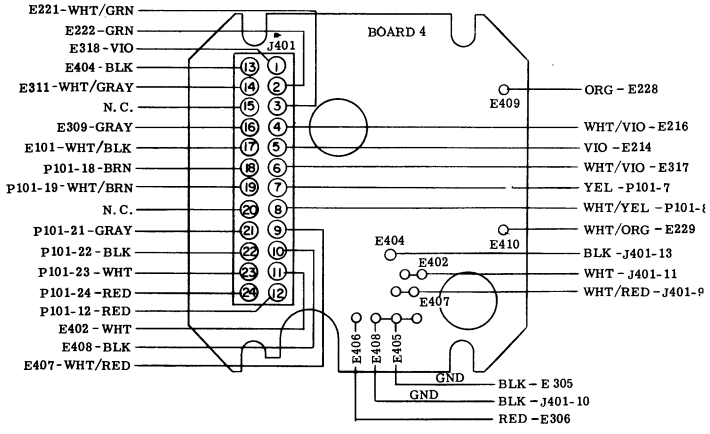
NARCO AVIONICS DGO 10

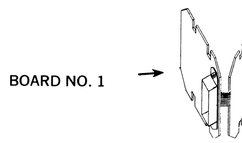


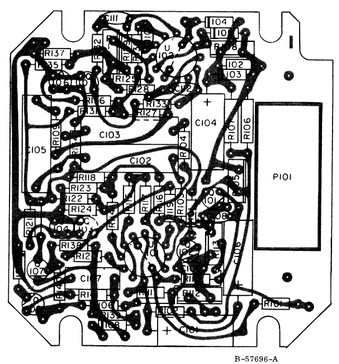


FOR TSO'D MODELS

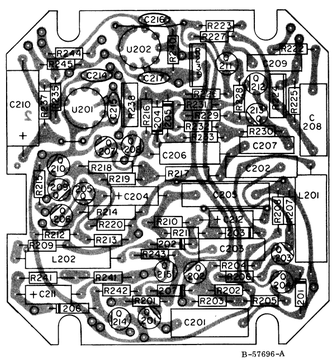








BOARD NO. 1



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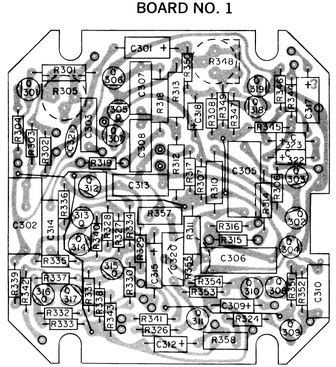

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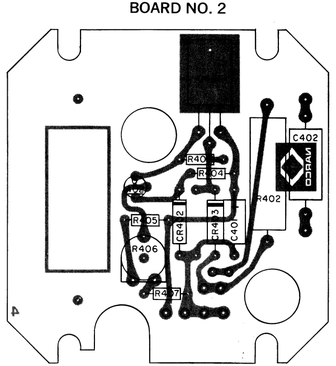

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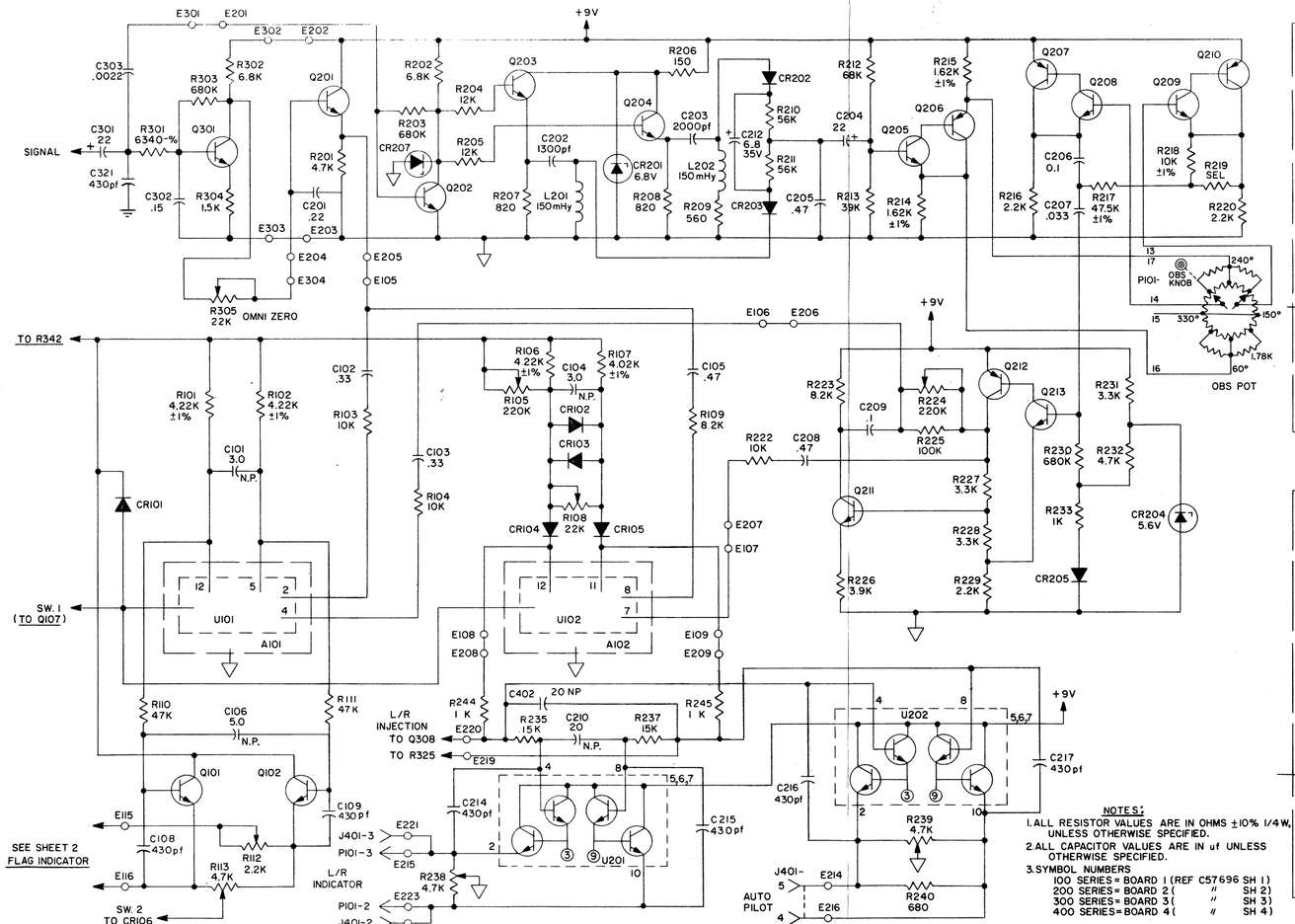
SIGNAL
+9V
OMNI ZERO
OBS KNOB
OBS POT
TO R342
SW. 1 (TO Q107)
SEE SHEET 2 FLAG INDICATOR
SW. 2 TO CR106
L/R INJECTION TO Q308
TO R325
L/R INDICATOR
AUTO PILOT
NOTES:
1. ALL RESISTOR VALUES ARE IN OHMS ±10% 1/4W, UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN uf UNLESS OTHERWISE SPECIFIED.
3. SYMBOL NUMBERS
100 SERIES = BOARD 1 (REF C57696 SH 1)
200 SERIES = BOARD 2 (" SH 2)
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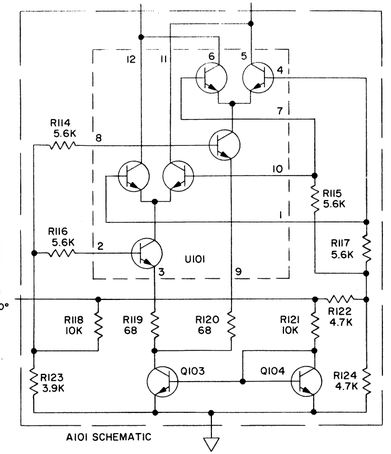
400 SERIES = BOARD 4 (" SH 4)



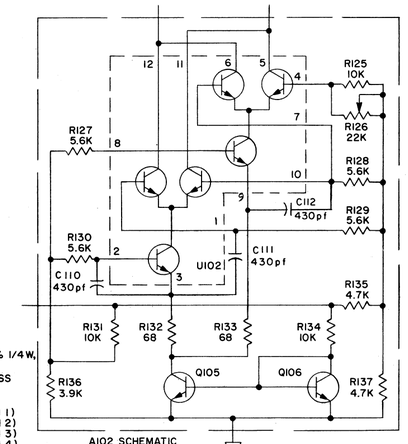
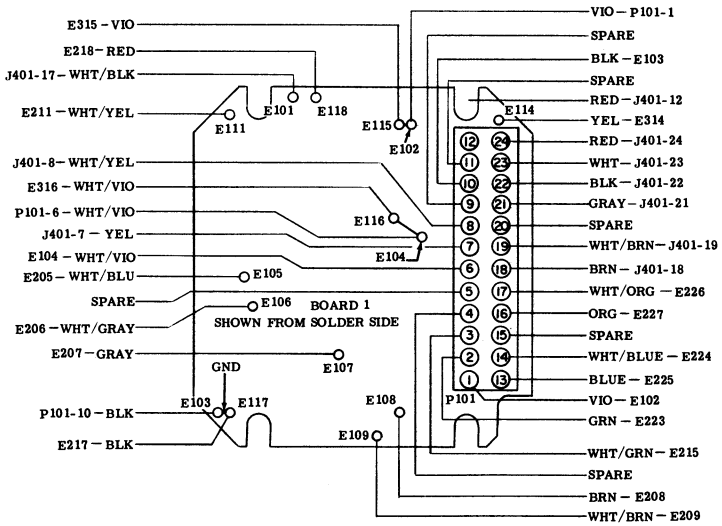
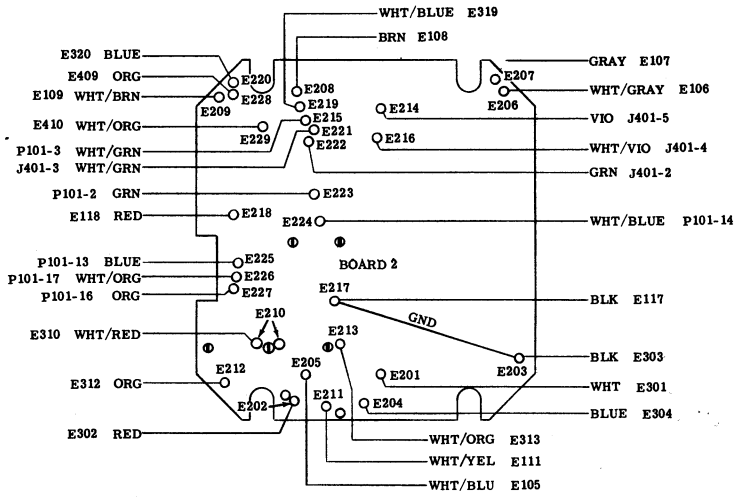
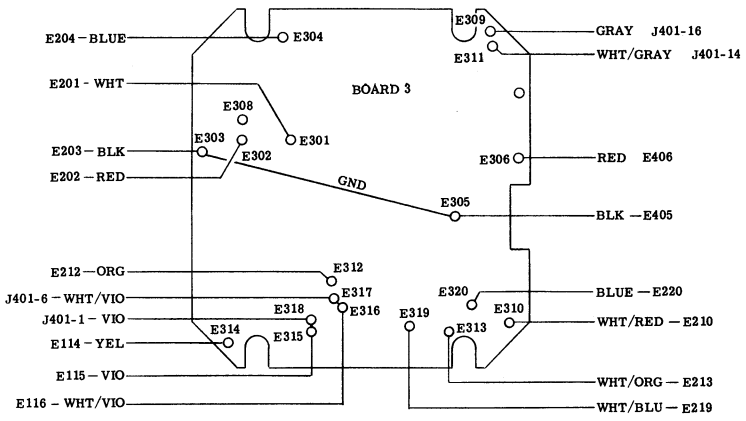


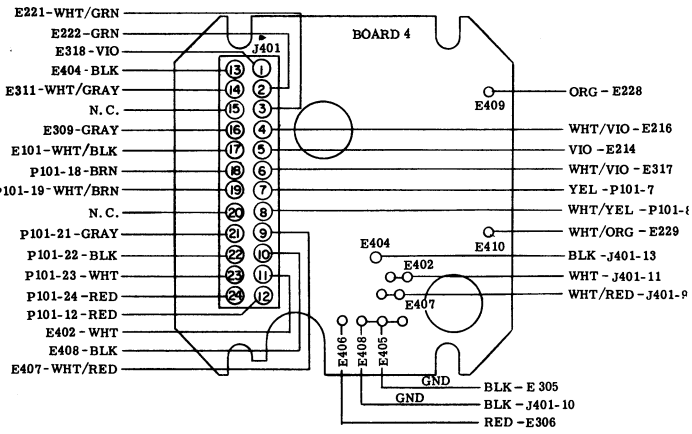
FIGURE 3.6-4. DGO 10 OMNI Schematic (Sheet 1 of 2)
CNG219 (TSO'd Models)

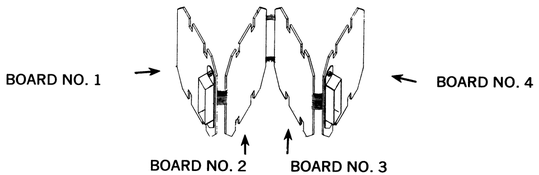


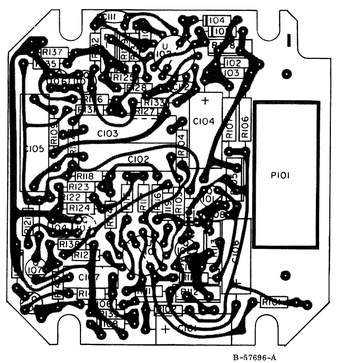


FOR TSO'D MODELS

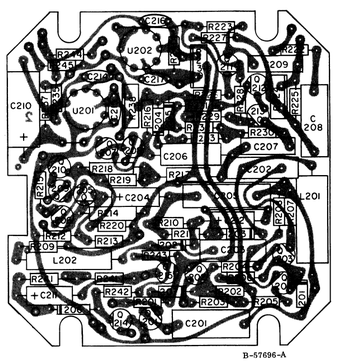








BOARD NO. 1



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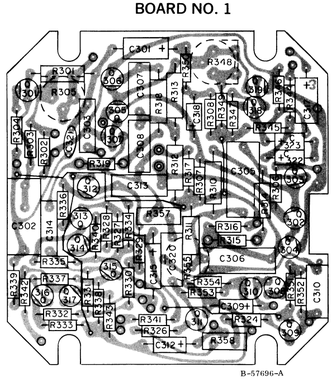

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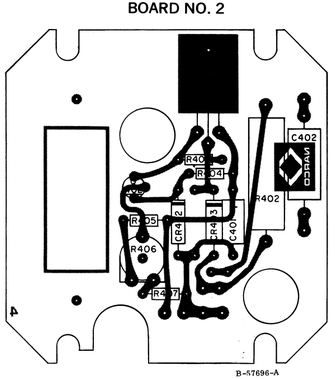

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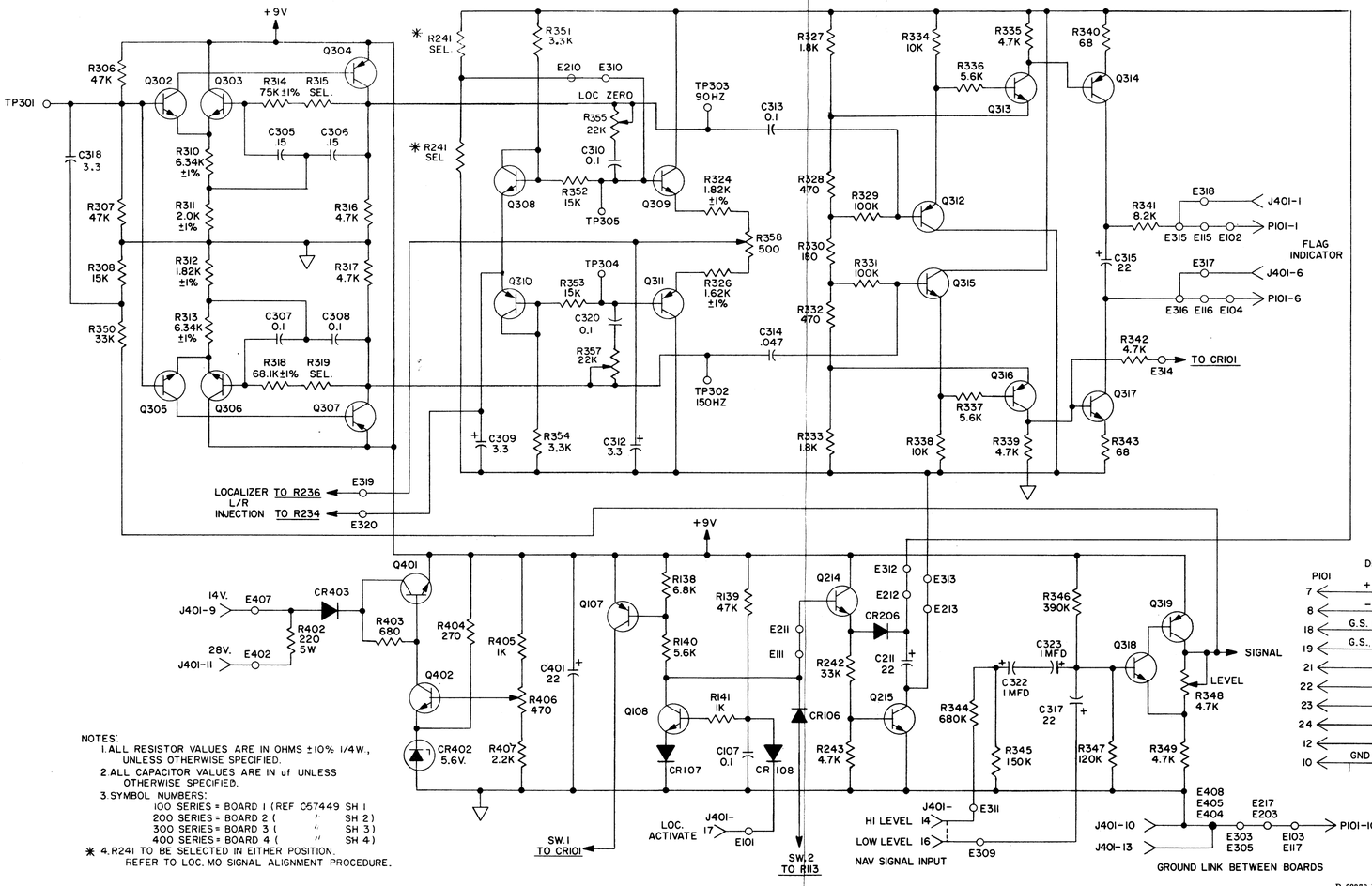

FIGURE 3.6-4. DGO 10 Localizer Schematic (Sheet 2 of 2) CNG219 (TSO'd Models)

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GYRO SECTION

Please make the following changes to the GYRO Section of your maintenance manual.

1. Section 4.1.4 SPECIFICATIONS, page 4-3
   Change Operating Limits to:
   Azimuth, 360°
   Pitch and Roll; 80° freedom through controlled precession, self-erecting, non-tumbling.

2. Section 4.1.4 SPECIFICATIONS, page 4-3
   Change Drift as follows:
   Maximum of 4° in 10 minutes . . .

3. Refer to Fig. 4.1-2, page 4-3:
   R3 changed to allow better cold temperature start.
   R3 was 2.7K ohm, ½w . . . then 1500 ohm, ½w . .
   NOW 1500 ohm, 1.5w
   Adjust schematic and parts list thereon to reflect this latest change.

4. Refer to Fig. 4.5-3, page 4-23:
   Item 10 has been modified to put OBS brake on the case. The new part (653-0107-104) IS interchangeable with the earlier part (653-0084-901). Adjust the parts list to reflect this change.

4.1 GENERAL

4.1.1 Scope

This section contains maintenance and overhaul procedures for Aviation Instrument Manufacturing Corporation's Directional Gyro Section (AIM 200-12) of the DGO 10. The associated OMNI Converter Section, which can be mounted on the rear of the DGO 10 or externally in a remote location, is not covered in this section. Instead, full details on the OMNI Converter Section are provided in Section 3.

Basically, this section covers only the gyroscopic and meter display elements of the DGO 10. Although this section was prepared with considerable attention to detail, no attempt has been made to instruct non-qualified personnel in the specific procedures required to overhaul the instrument. Instead, the section is intended only as a guide for experienced gyro mechanics.

4.1.2 General Description

The DGO 10 Directional Gyro/Omni combines the features of a directional gyro, an omni indicator/course selector, and a glide slope indicator into a single 3-inch panel mounted instrument. The unit is integrally lighted, and includes an internal 14 vdc inverter or a 28 vdc inverter, depending on the model selected.

The unit is fully self-contained, and includes the necessary signal conditioning electronics for processing input signals from conventional VOR and glide slope receivers. The solid state OMNI Converter section is packaged as a plug-in module to facilitate maintenance and to permit installation of the DGO 10 in any instrument panel. When adequate behind-the-panel clearance is available, the OMNI Converter section can be left mounted on the rear of the DGO 10 case. When clearance behind the panel is critical, the OMNI Converter section can be enclosed and remotely mounted elsewhere in the aircraft.

4.1.3 Construction Details

4.1.3.1 General

The basic internal construction of the DGO 10 is shown in Figure 4.5-1 thru 4.5-4. The functional center of the instrument is an accurately balanced, high speed electric rotor which is mounted on precision bearings inside an enclosed rotor housing (55, Figure 4.5-1). The rotor drive voltage is the 115 vac, 400 Hz output of an internal solid state inverter (5, Figure 4.5-1). The single phase inverter output is phase shifted by a 0.22 mfd capacitor (C1) in series with one of the rotor windings, and the two phases are applied to the rotor through brush block/slip ring assemblies in the top of the instrument case and in one side of the gimbal (57, Figure 4.5-1).

Small impellers are affixed to the top and bottom of the rotor to generate sufficient air flow to allow the rotor to self-erect. Air is exhausted from the rotor housing through two horizontally opposed erector jets, and pushes against a semicircular erector vane (31, Figure 4.5-1) attached to the gimbal. The entire assembly acts as an air valve so that when the spin axis of the rotor is inclined from the horizontal position, one erector jet will be closed while the air being expelled from the opposite erector jet will exert torque about the vertical axis of the gimbal. This action precesses the spin axis of the rotor to the horizontal position so that the opposing jets are opened an equal amount and the gimbal is again stable.

The rotor housing is suspended from bearings mounted in the gimbal assembly and is free to pivot in the vertical plane up to ±80° from horizontal. In turn, the gimbal assembly is suspended from bearings mounted in the instrument case so that the over all assembly has complete freedom of movement about its vertical axis.

The dial assembly (21, Figure 4.5-3) is positioned by a large spur gear/clutch assembly at the top of the gimbal. The dial assembly includes the dial ring, the course selector Nose/Tail indicator, the Left-Right indicator, the To-From-Off indicator, and an omni potentiometer which will be discussed later.

The clutch mechanism at the top of the gimbal permits resetting the gyro heading or course selection with minimum repositioning of the gimbal. A caging knob is provided in the lower left corner of the instrument face to simultaneously cage the gyro and to readjust the heading indication. Resetting the heading indication does not effect the setting of the course selector, because the course selector Nose-Tail indicator, the To-From indicator, and the Left-Right indicator are free to rotate along with the heading dial card.

The course selector knob in the lower right corner of the instrument face permits resetting the desired course to or from a VOR station, without effecting the gyro heading indication. When the knob is actuated, a shank on the course selector shaft presses against a brake inside the bezel to hold the dial card in position while the Nose-Tail indicator is being repositioned. When the shaft is released, the Nose-Tail indicator and associated omni meters are again free to rotate with the dial ring.

4.1.3.1 General (Cont'd)

The omni potentiometer which is also housed in the dial assembly provides a means for selecting the desired course. This device phase shifts the reference phase omni signal as a function of selected course. The signal is then compared with the variable phase omni signal and the difference determines the position of the Left-Right and To-From indicators. The wipers of the potentiometer are fixed to the back of the dial ring hub, while the potentiometer winding is fixed to the front of the meter housing (13, Figure 4.5-4). When the course selector knob is actuated, the dial ring and wiper are held in place while the Nose-Tail indicator and the omni pot winding are rotated to a new position. This new selected VOR course is then represented by the electrical resistance through the new points of contact on the potentiometer winding. When the course selector knob is released, the wiper and winding are allowed to move together, along with the dial ring, so that relationship of the two will not change when a new heading is assumed.

The To-From indicator, the Left-Right indicator, the Glide Slope indicator, and the Glide Slope warning indicator are simple meter movements which are driven by signals generated in the omni converter, the VOR receiver, and the glide slope receiver. The Heading (HDG) warning indicator provides an indication of power failure to the rotor, and to some extent, insufficient rotor speed. Instructions are provided in Section 4.4 for checking the accuracy and setting of these meters.

4.1.3.2 Rotor, HDG Flag Meter, and Inverter Circuitry: 14 vdc Models

A schematic diagram of the rotor, HDG flag meter, and 14 vdc inverter is shown in Figure 4.1-1. Choke L1 in the inverter input serves as a transient suppressor and also blocks square wave noise from feeding back into the dc power source. Diode CR2 provides reverse polarity protection for the inverter circuitry.

Capacitors C3 and C4 stabilize the dc input voltage to improve the output waveshape, and also assist in suppression of transients. Diode CR3 prevents the voltage across either half of the primary winding from exceeding the supply voltage when the inverter switches from one conducting transistor to the other.

Circuit operation is sustained by the alternating polarity of feedback windings FB1 and FB2. The resultant output is a 115 vac, 400 Hz, single phase square wave applied directly to the rotor windings. Capacitor C1 produces the two-phase effect necessary for rotor operation. Diode CR1 produces the dc voltage required for operation of the flag meter. If the inverter output becomes inadequate to properly drive the rotor, the warning flag will appear.

Operating specifications for the flag meter and inverter circuit are provided in the Test and Calibration procedures of Section 4.4.

C1 Capacitor, 0.22 mfd, 400 v
C2 Not used
C3 Capacitor, 200 mfd, 20 v, electrolytic
C4 Capacitor, 200 mfd, 20 v, electrolytic
CR1 Diode, 1N2070 or 1N4004, Motorola
CR2 Diode, MR1121, Motorola
CR3 Diode, 1N4004 or 1N2070, Motorola
L1 Choke, AIM P/N 803-0010-001
M1 Meter, flag, AIM P/N 820-0016-001
Q1 Transistor, 2N4920, Motorola
Q2 Transistor, 2N4920, Motorola
R1 Resistor, 1000 ohm, 1/2 watt
R2 Resistor, selected, 1/2 w (approx. 100 k
T1 Transformer, AIM P/N 804-0028-001

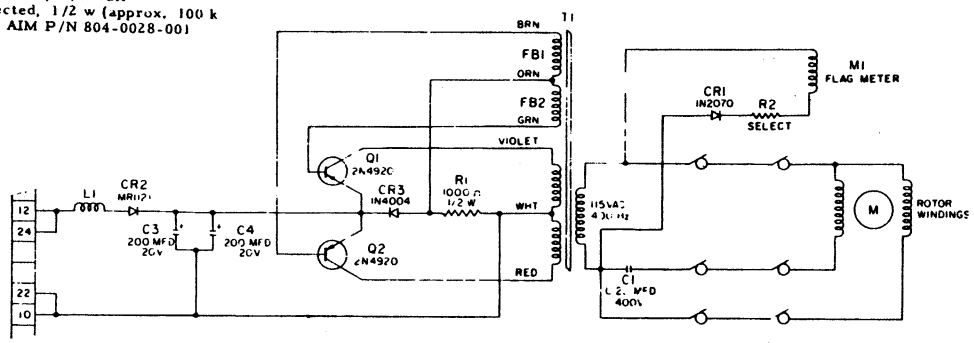


FIGURE 4.1-1 ROTOR, FLAG METER, AND INVERTER CIRCUITRY: 14VDC MODELS

4.1.3.3 Rotor, HDG Flag Meter, and Inverter Circuitry: 28 vdc Models

A schematic diagram of the rotor, HDG flag meter, and 28 vdc inverter is shown in Figure 4.1-2. Choke L1 in the inverter input serves as a transient suppressor and also blocks squarewave noise from feeding back into the dc power source. Diode CR2 provides reverse polarity protection for the inverter circuitry.

Zener diode CR3 provides suppression of transient voltages which may momentarily occur at the input.

Inverter circuit operation is sustained by the alternating polarity of feedback windings FB1 and FB2. Zener diodes CR4 and CR5 improve to output waveshape by eliminating the leading edge spike caused by the inductive collapse of the transformer primary during switching. The resultant output is a 115 vac, 400 Hz, single phase square wave applied directly to the rotor windings. Capacitor C1 produces the two-phase effect necessary for rotor operation. Diode CR1 produces the dc voltage required for operation of the flag meter. If the inverter output becomes inadequate to properly drive the rotor, the warning flag will appear.

Operating specifications for the flag meter and inverter circuit are provided in the Test and Calibration procedures of Section 4-4.

4.1.4 Specifications

Operating Limits
Azimuth, 360°

Pitch and Roll; 360° freedom through controlled precession

Drift
Maximum of 4° and 10 minutes for any heading when subjected to roll, pitch, and yaw oscillations with an amplitude of ±3 degrees about each axis, at a frequency of 5 to 7 oscillations per minute.

Operating Temperature Range
-30°C (-22°F) to +50°C (+122°F)

Rotor Speed
23,500 rpm nominal

Heading Indicator
Circular dial ring presentation with matte white 30° primary markings, 10° secondary markings, and 5° tertiary markings.

Mounting
Standard 3⅛ in. cutout in shock mounted panel.

Case Size
See outline drawing, Figure 2-13.

Weight
4.7 lbs. nominal (including converter)

FAA Specification (Gyro Element Only)
TSO-C5c

Power Requirements (Gyro Only)
14 vdc Instruments _____ 14 vdc, 1.5 amps max.
28 vdc Instruments _____ 28 vdc, 0.8 amps max.

4.2 INSTALLATION

All pertinent information pertaining to the installation is provided, in detail, in Section 2 of this manual.

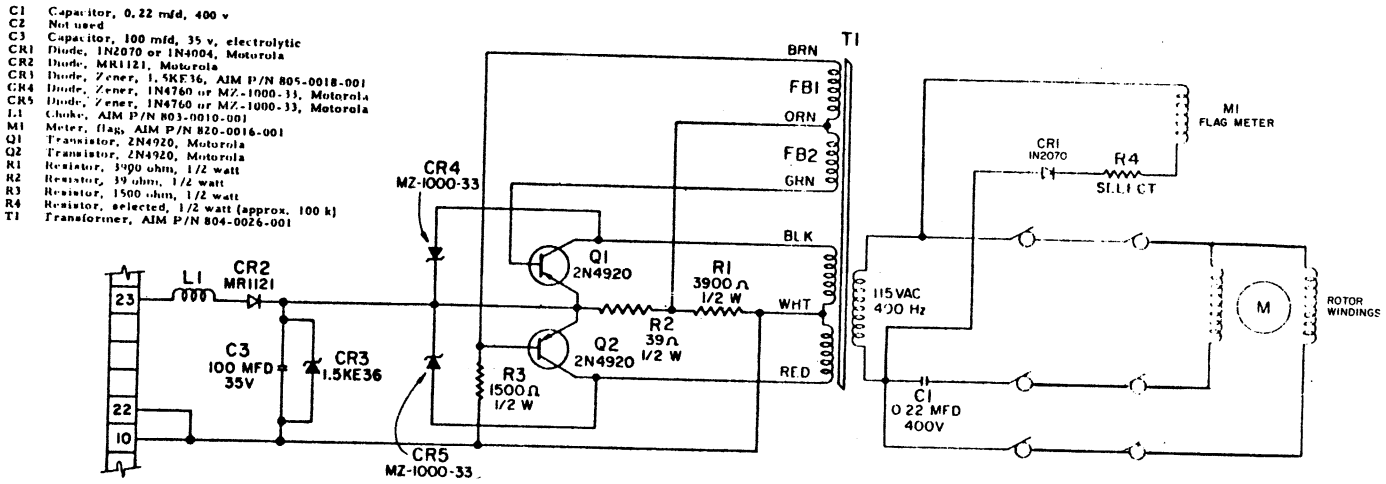


FIGURE 4.1-2 ROTOR, FLAG METER, AND INVERTER CIRCUITRY: 28 VDC MODELS

4.3 GENERAL, OVERHAUL

This section contains instructions for overhauling the DGO 10 Directional Gyro/Omni Indicator. Overhaul consists of limited disassembly of the instrument to permit replacement of seven strategic bearings which are the only parts subject to significant wear and performance degradation (13 and 39, Figure 4.5-1; Figure 4.5-2; and 19, Figure 4.5-3).

While the instrument is disassembled, the inspection procedures of paragraph 4.3-4 provide detailed instructions for checking the performance of those elements which are not routinely disassembled. If further repair or replacement is required, detailed instructions are provided in the Repair or Replacement procedures of paragraph 4.3.5.

As the instrument is disassembled, the location and position of each component should be noted so that each component can be replaced in the same position. When handling the circular dial ring, care must be taken to avoid soiling the various markings. All bearings and pivots should be handled with assembly tweezers to avoid contamination. Iridited, oxided, or passivated parts must be protected against scratching or marring. Self-locking nuts with worn fibers must be replaced. Nuts and screws used for balancing must be secured in a final, adjusted position by Glyptal (G. E. Trademark). Solvents used for cleaning must be high-grade, such as Chlorothene-Nu (Dow Chemical Co.)

4.3.1 Tools Required

4.3.1.1 General

Although the instruments can be completely disassembled and reassembled using only the standard instrument shop handtools listed in paragraph 4.3.1.2 special attention should be given to the additional equipment required in Section 4.4. This equipment, although not directly used in assembling or diassemble the instruments, must be available to properly calibrate and check-out the instruments' operating characteristics after overhaul.

Construction of the spanner wrenches listed under paragraph 4.3.1.2 (g) is shown in Figure 4.3-1. Spanner wrench "B" is used in removing the threaded bearing housings from the gimbal assembly. Spanner "A" is used to tighten the lock ring while spanner B holds the threaded housing in place.

Spanner "C" is used in removing the rotor support nuts from each end of the rotor housing.

4.3.1.2 Handtools

a. Assembly tweezers

b. Eye loupe

c. Selection of small screwdrivers

d. No. 4 and No. 8 Allen wrenches

e. No. 2 and No. 4 Bristol spline wrenches

f. ¼ inch and 3/16 inch open-end wrenches

g. Spanner wrenches of Figure 4.3-1.

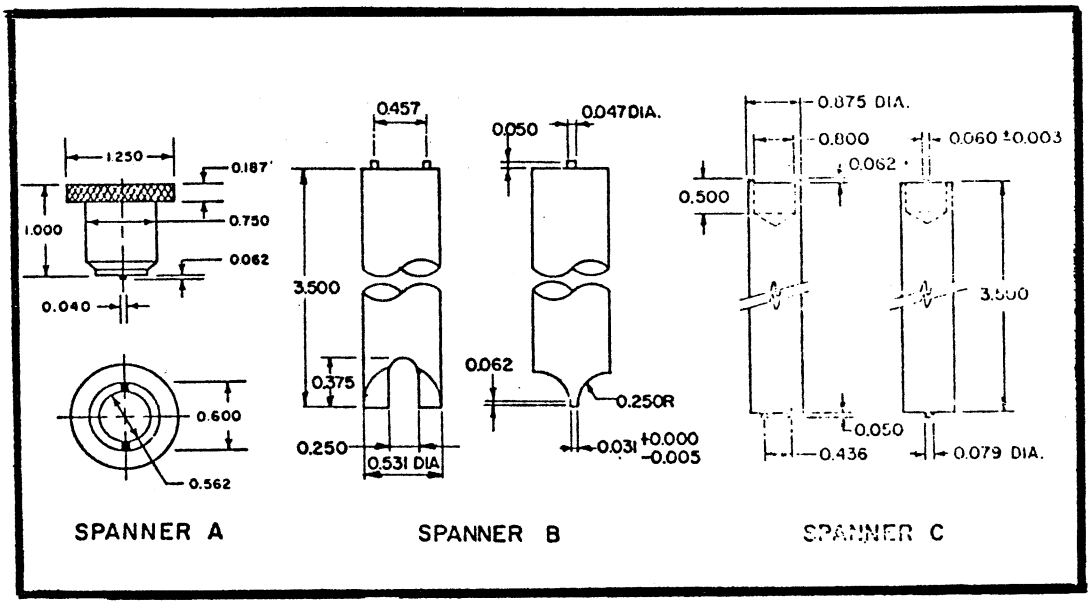


FIGURE 4.3-1 SPANNER WRENCHES

4.3.1.3 Expendable Supplies

The following expendable supplies should be available before attempting to overhaul the instruments:

a. ½ gallon of Chlorothene-Nu (Dow Chemical Co.

b. Watch paper

c. Blue Glyptal (General Electric Co.)

d. Red Locktite

4.3.2 Disassembly Procedures

4.3.2.1 General

Before proceeding with disassembly of the instrument, refer to the test procedures of paragraph 4.4.2 to check the performance of the omni potentiometer and the various meter elements. If a defect is noted, disassemble the instrument in accordance with the following paragraphs and refer to the appropriate Repair or Replacement Procedure of paragraph 4.3.5 for specific instructions.

Before proceeding with disassembly of any component, the degree of wear, end play, backlash, and general physical appearance must be checked and noted as an aid in reassembly.

During disassembly, extreme care must be used in the removal of any component. Use of proper tools is important to prevent damage by scratching or marring. Many of the parts are secured with Glyptal and it will be necessary to dissolve the Glyptal before removing these parts. Screws or other attaching parts must be carefully identified during disassembly for correct replacement during reassembly.

Due to delicate rebalancing required, and the precision parts involved, disassembly and overhaul of the rotor and rotor housing assembly is not recommended. Should the rotor become defective and fail to meet the performance requirements set forth in Section 4.4, return the used rotor housing and pivot assembly to AIM for an exchange discount on a new replacement assembly.

If overhaul of the rotor should become necessary in the field, disassembly instructions are provided in paragraph 4.3.2.4.

4.3.2.2 Removal of Gimbal Assembly (Figure 4.5-1)

1. Remove five screws (2, Figure 4.5-1) securing the dust cover (1) to the rear of the instrument. Slip the dust cover toward the rear of the case and away from the instrument.

2. Loosen the lock ring (12) on the top of the instrument and remove the threaded bearing pivot (11) from the case.

3. Turn the instrument over, being careful to avoid damage to the gimbal.

4. Remove one screw (15) and carefully remove the brush block assembly (14) from the bottom of the case.

5. Remove the two screws (17) securing the lower bearing housing (16) in place.

6. Removal of the lower bearing housing permits access to the two screws (44) securing the pivot (42) to the bottom of the gimbal. When the pivot is lifted into the bearing housing recess, the entire gimbal assembly may be removed.

4.3.2.3 Removal of Rotor Housing Assembly (Figure 4.5-1)

1. Loosen the two #2-56 Bristol setscrews holding the erector vane (31, Figure 4.5-1) to the gimbal and remove the erector vane. Also loosen the binder head stop screw (33) enough to permit 360° rotation of the rotor housing.

2. Remove one screw (35) and carefully remove the brush block (34) from the side of the gimbal.

3. Remove two screws (37) and remove the bearing housing (36).

4. Remove two screws (52) securing the pivot (50) to the side of the rotor.

5. Loosen lock ring (41) and remove the threaded bearing housing (40) from the opposite side of the gimbal.

6. Remove three screws (54) and lift the rotor pivot (53) off the rotor housing and out through the threaded opening. Remove the rotor housing assembly (55) from the gimbal.

NOTE

Due to delicate rebalancing required, further disassembly of the rotor housing assembly is not recommended. Instead, return the used rotor housing assembly to AIM for an exchange discount on a new replacement assembly.

If overhaul of the rotor becomes necessary in the field, disassembly instructions are provided in paragraph 4.3.2.4

4.3.2.4 Disassembly of Rotor Housing Assembly (Figure 4.5-2)

1. Remove one support nut (9, Figure 4.5-2 and the four screws (17) holding the two halves of the rotor housing (10) together.

2. Carefully separate the two halves and remove the rotor assembly.

3. To obtain access to the rotor bearings, remove the impellers (2 and 3) from each end, and remove the preload nut (1) and spacer (12) from each end of the rotor shaft. The bearings (5) are protected by a small bearing retainer (4) over each end of the rotor shaft.

4. Care should be taken to avoid loss of the spacers and bearing retainers located between the preload nut and the bearing on each end of the rotor shaft.

NOTE

Removal of the bearing housings on each end of the inertia ring is not normally required, and is not recommended. If either housing is removed, delicate rebalancing of the inertia ring assembly will be required. If the housing must be removed to obtain access to the stator, it is suggested that a mark be made at the interface between the inertia ring and each housing to simplify reassembly and minimize rebalancing required.

4.3.3 Cleaning

4.3.3.1 General

Due to the precision components and close tolerances employed in the manufacture of this unit, foreign matter can greatly impair its overall operating efficiency and service life. It is therefore recommended that every possible step be taken to insure maximum possible protection of each subassembly and part while the dust cover is removed from the instrument. Each component should be placed in a dust-free environment and protected with a dustproof cover.

4.3.3.2 Pivots, Housings, and Miscellaneous Hardware

During overhaul, all parts should be cleaned carefully to remove oil, dirt, and moisture. If possible, the use of ultrasonic cleaning is highly recommended to insure that all parts with small bores or tapped holes can be effectively cleaned. If this is not possible, component parts such as pivots, bearing housing, shims, etc. should be thoroughly cleaned in a high grade solvent such as Chlorothene-Nu (Dow Chemical Company), and then thoroughly air dried with clean, low pressure air. If cleaning solvent is used, it must not be allowed to become dirty and must be changed frequently.

Interiors of small holes should be cleaned with pegwood dipped in solvent. The teeth of gears and pinions should be cleaned with a glass fiber brush.

Extreme care should be taken to avoid damage to small or delicate parts during cleaning. In addition, some arrangements must be made to permit identification of each part with respect to its previous location in the instrument. This is particularly true of bearings, pivots, and screws. After cleaning, some provision must be made to adequately protect the parts from damage and dust while awaiting inspection and reassembly.

4.3.3.3 Bezel Glass

Refer to paragraph 4.3.5.2 (4) for special instructions on cleaning the bezel glass.

4.3.4 Inspection

4.3.4.1 General

All parts should be thoroughly examined with an eye loupe for any evidence of excessive wear or damage prior to reassembly. Repair of defective parts is recommended only when it can be done without adversely effecting the proper operation of the instrument. If doubt exists as to the operating condition of any part or assembly, refer to the parts list section of this manual and order replacement parts directly from AIM.

During overhaul, examine each part for evidence of corrosion or breakdown in the plating material. Aluminum parts of the gyro are protected by anodize or iridite treatment and stainless steel parts are passivated. If a crocus cloth is used to remove corrosion, or if the plating material appears to be worn through, replate or protect the defective area with a light coat of clear lacquer.

Particular attention should be given to parts which contain internal or external threads. If any evidence of damage to the threads is found, repairs should be made using the correct tap or thread restorer. The part should then be thoroughly recleaned and reexamined prior to assembly.

4.3.4.2 Bearings

The precision bearings used throughout the instrument are designed to provide extremely efficient service over long periods of time. If defects are noted, the bearing must be replaced. No attempt should be made to polish the balls, or otherwise repair the separate bearing parts.

Bearings used in this instrument are precision, instrument grade and must not be replaced with inferior substitutes. Each bearing is lubricated with specific quantities and types of lubricants best suited for its individual function. This lubricant improves the performance of the bearings and substantially increases their service life. It is therefore recommended that replacement bearings be ordered directly from AIM in order to insure maximum operating efficiency.

4.3.4.3 Pivots

The four pivots used to support the gimbal and rotor housing assemblies are specially designed for specific functional locations in the instrument. Each pivot is distinctly constructed so that it must not be interchanged with other pivots during reassembly.

Each pivot or support shaft should be examined carefully for evidence of pits and scoring. Due to the precision fit of their respective bearings, the pivots should seldom incur any type of excessive damage. If small scratches are noted, a light polishing should be all that is necessary to remove them. However, if scoring or other excessive wear is noted, replacement pivots should be secured from AIM.

4.3.4.4 Dial Assembly (Figure 4.5-3)

Inspect the dial assembly (21, Figure 4.5-3) for excessive discoloration of the various pointers, indicators, and dial markings.

Check the assembly for freedom of movement about the roll axis. Rotate the dial assembly slowly to check for any detectable drag or bearing roughness. If roughness is detected, determine that it is not caused by improper gear mesh between the crown gear (22, Figure 4.5-3) and the intermediate gear (64, Figure 4.5-3), or by defective intermediate gear bearings (63). If it is determined that the roughness is produced by the dial assembly bearings (19 and 23) the bearings must be replaced.

For bearing replacement, or for replacement of any dial assembly components, refer to the Dial Assembly Repair or Replacement procedure of paragraph 4.3.5.3.

NOTE

The front dial assembly bearing (19, Figure 4.5-3) is subject to extreme sideloading due to pressure exerted by the brake (15, Figure 4.5-3) when the OBS shaft is actuated. Consequently, this bearing should be routinely replaced during overhaul. Refer to the Bezel Assembly Repair or Replacement procedure of paragraph 4.3.5.2 for specific instructions.

4.3.4.5 Intermediate Gear Assembly (Figure 4.5-3)

Remove two screws (62, Figure 4.5-3) and remove the intermediate gear assembly (61-66) from the eccentric (59). Rotate the intermediate gear (64) on its bearings (63) to check for roughness or excessive end play in the assembly. If defects are noted, refer to the Intermediate Gear Repair or Replacement procedure of paragraph 4.3.5.4.

If the assembly functions properly, reinstall in the eccentric with two screws (62).

4.3.4.6 Bezel Assembly

Inspect the bezel assembly for cracked or scratched bezel glass. Refer to the Bezel Assembly Repair or Replacement procedure of paragraph 4.3.5.2 before attempting to clean or repair the bezel assembly.

4.3.5 Repair or Replacement

4.3.5.1 General

Seven strategic bearings (13, 39, Figure 4.5-1; 5, Figure 4.5-2; and 19, Figure 4.5-3) must be routinely replaced during overhaul. All other bearings are to be replaced as required, subject to the inspection procedures of paragraph 4.3.4.

Replace all parts which are worn or damaged. Minor nicks and scratches or corrosion spots may be blended and polished out of aluminum parts and painted surfaces using a fine grade of crocus cloth. Blend reworked area into surrounding surface. All steel parts having rust or corrosion must be replaced.

4.3.5.2 Bezel Assembly (Figure 4.5-3)

(1) General

The bezel assembly actually consists of a display bezel (10, Figure 4.5-3) and a lighting bezel (6, Figure 4.5-3). During overhaul, the two units must be removed in order to replace the front dial assembly bearing (19). Further disassembly of the bezel is not normally required unless a specific defect exists.

Lamps in the lighting bezel are housed in a replaceable lighting tray (8) which can easily be removed from the top of the assembly.

(2) Removal of Bezel Assembly

1. Remove the caging knob (1) and the OBS knob (2) by loosening the setscrew holding each knob to its respective shaft.

2. Remove 5 screws securing the lighting bezel to the display bezel. Remove the lighting bezel and 2 screws securing the display bezel to the case.

3. Remove the bezel assembly carefully. The small bearing (19) which supports the front of the dial assembly is positioned inside a small bore in the center of the bezel glass. While removing the bezel assembly, check carefully for small spacers which are mounted in front of and behind the bearing. When the bezel is removed, the spacers and bearing may coincidentally remain either on the front pivot or inside the bore in the bezel glass. Note the position of each spacer with respect to the bearing, and set aside for exact replacement during reassembly. Discard bearing (19).

(3) Disassembly of Bezel Assembly

If the lighting bezel is defective, or if the lighting bezel glass is cracked or scratched, the lighting bezel should be replaced as an assembly. Simply remove five screws securing the lighting bezel to the front of the display bezel.

If the display bezel glass (12) is cracked or scratched, remove the lighting bezel as described above and remove the retaining ring (11) holding the display bezel glass in place. Apply sealant around the edge of the replacement glass and install in the bezel. Use a master square to align the north/south markings with the vertical centerline of the bezel. Reinstall the retaining ring and the lighting bezel on the front of the display bezel.

(4) Cleaning

The glass in both the display bezel and in the lighting bezel must not be cleaned with solvents or solutions. If cleaning is required, wipe lightly with a soft cloth. Rough cloth or abrasive tissue will permanently scratch the finish.

During over haul, apply a light film of nonstatic coating fluid to the inside of the display glass (12). A typical solution, "STATNUL Anti-Static Solution," is manufactured by Weston Instruments, Inc., Newark, N.J.

This coating prevents the build-up of static electricity in the glass. A static charge on the glass can slightly deflect the meter indicators when the bezel is placed on the front of the instrument, thus adversly effecting the meter accuracy.

(5) Installation of Bezel Assembly

NOTE

The number of spacers (20) required cannot be determined until the last steps in reassembly of the instrument. Therefore, it is suggested that the bezel be installed temporarily, using the same spacers previously installed. Installation of the bezel at this time will prevent damage to the dial assembly and display elements during reassembly.

Installation of the bezel assembly on the instrument requires special attention to the selection and positioning of the parts (17, 18, 20) used in conjunction with front dial assembly bearing (19). The first item into the bore in the bezel glass is a black bearing cover (17). This part may or may not have come out when the bezel was removed from the instrument. Spacer (18) is the next item into the bore in the bezel glass and the bearing (19, Figure 4.5-3) fits into the bore on top of the spacer.

The number of spacers (20) must be selected to prevent the bearing from working out of its bore after the bezel assembly is in pluce. The spacers are identifiable by their finish; item 18 is aluminum and item 20 is black oxide coated. Trial-and-error will be necessary to achieve the proper positioning of the bearing.

4.3.5.3 Dial Assembly

(1) General

The dial assembly (21, Figure 4.5-3) should rarely require repair or replacement. Even though removal of the dial assembly may not otherwise be required, removal may be necessary if eccentric (59) is adjusted during final reassembly of the instrument. Removal of the dial assembly permits installation of shims (22) as required to achieve proper gear mesh between the intermediate gear (64) and the crown gear (22, Figure 4.5-4).

(2) Removal of Dial Assembly

1. Remove the bezel assembly as described in paragraph 4.3.5.2 (2).

2. Remove four screws (50, Figure 4.5-3) and position the Glideslope flag (48) and the Heading flag (75) to the side so that the dial assembly will not be obstructed during removal.

3. Remove four screws (56, 57) and remove the guard pointer (55).

4. Loosen two screws (54) and remove the Glideslope meter and housing (53).

5. Remove collar (31), spring (33), and spur gear (34) from each side of the instrument. It may be necessary to loosen setscrews (36) and rotate eccentric shafts (35) slightly in order to clear spur gears (34) past pinion gears (27 and 30).

6. Support the dial assembly and loosen nut (67) until it hangs loose on the rear of the assembly.

7. Carefully hold the brushes (70) clear of the slip ring and remove the dial assembly through the front of the case.

8. Remove two screws (24) and replace bearing (23). Reinstall two screws securing the bearing in place.

(3) Disassembly of Dial Assembly (Figure 4.5-4)

The following procedure describes the complete disassembly sequence for the dial assembly. Disassembly is recommended only as far as is necessary to replace a specific defective component.

1. If the crown gear (22, Figure 4.5-4) or spur gear (21) are defective, remove two screws (23) to replace.

2. Remove four screws (24) holding the front pivot (4) and the dial ring and hub (1) to the meter housing (13)

3. If the front pivot must be replaced, it will be necessary to remove the dial ring. The dial ring, the dial ring hub, and the omni pot wiper are supplied as a precision balanced assembly. Before removing the dial ring, note the exact position of the dial ring with respect to the dial ring hub. After replacement of the front pivot, reinstall the dial ring in precisely the same position. Do not rotate 180 degrees with respect to the dial ring hub.

NOTE

Do not resolder or otherwise repair the omni pot wiper inside the dial ring hub. The wiper, hub, and dial ring are a precision balanced assembly which must be replaced as a unit.

4. Remove two screws (7) and remove the meter mask (6).

5. Remove two screws (9) and remove the rear mask (8).

6. Remove screws (15 and 17) to remove the OMNI Meter Assy (11) from the meter housing assembly. Removal of clamping screw (17) permits the To-From meter (10) to be extracted from the clamp. The OMNI meter cannot be removed. If the meter is defective replace the complete assembly.

7. If any portion of the meter housing/contact ring/slip ring assembly (13) is defective, replace the entire assembly.

(4) Reassembly of Dial Assembly

To reassemble the dial assembly, simply reverse the procedures of paragraph (3) above. Install meter (10) in the OMNI Meter Assembly (11) and secure inside the meter housing assembly (13) with two screws (15 and 17). Check that one balance weight (14) is installed on each side of the meter housing. Install the rear mask (8), meter mask (6) and the wiper/hub/dial assembly, including pivot (4), on the front of the meter clamp and meter housing.

(5) Installation of Dial Assembly (Figure 4.5-3)

NOTE

The number of shims (22) required cannot be determined until the last steps in reassembly of the instrument. Therefore, it is suggested that the dial assembly not be installed until called for in the final reassembly procedure.

1. Install shim (22) over the rear dial assembly pivot. The number of shims used must be selected to insure proper gear mesh between the intermediate gear (64) and the crown gear (22, Figure 4.5-4). Trial-and-error will be necessary. As previously noted, the number of shims required cannot be determined until the gimbal is installed, and the intermediate gear has been adjusted to properly mesh with the gimbal gear.

2. Hold nut (67, Figure 4.5-3) in position and insert the dial assembly into the front of the case while observing the brush block (70) to avoid damage to brushes.

3. Tighten nut securely and temporarily install bezel (10) and bearing (19) to check for proper gear mesh between the intermediate gear and the crown gear. If gear mesh is incorrect, remove bezel and dial assembly, and add or remove shims (22), as required to achieve proper gear mesh. Use trial-and-error, alternately replacing and removing the bezel until the assembly is properly positioned. Tighten nut (67) securely.

4. Check that each brush (70) is properly formed to lie in its respective slip ring groove. If required, install additional spacers (71) to achieve proper brush block alignment.

5. Reinstall spur gear (34), spring (33), and collar (31) in each side of the instrument.

6. Position each collar (31) along its respective shaft (35) so that spring (33) will force the spur gear (34) fully toward the rear when the caging shaft or OBS shaft is actuated.

7. Loosen setscrew (36) and rotate each eccentric shaft (35) to achieve optimum gear mesh of the spur gears (34) with both the pinion gear (27 or 30) and the spur gear (21, Figure 4.5-4) when the caging shaft or OBS shaft is actuated. Tighten setscrew (36, Figure 4.5-3) on each side of the instrument when proper adjustment is achieved.

8. If further access to the front of the instrument is no longer required, reinstall the Glideslope meter and housing (53), pointer guard (55), Glideslope flag meter (48), and Heading meter (75).

9. Replace bezel assembly on the front of the instrument as described in paragraph 4.3.5.2. (5).

4.3.5.4 Intermediate Gear Assembly (Figure 4.5-3)

1. If the intermediate gear assembly (61-66) requires repair, remove two screws (62) and remove the assembly from the eccentric (59).

2. Remove preload nut (66) and replace two bearings (63), along with any other defective parts. Reassemble and tighten preload nut until end play barely disappears.

3. Reinstall the assembly in the eccentric (59) with two screws (62). Tighten screws securely.

4.3.5.5 Caging Mechanism and OBS Shaft Assembly

Reassembly of caging mechanism and OBS shaft assembly requires no specific sequence of operations. However, special attention should be given to the following details.

If the caging plate (26, Figure 4.5-1) and the nylon actuating carriage (27) are removed during disassembly, care should be taken to insure that the steel wire spring (29) are properly positioned during reassembly. The springs should be tightened down and stressed so that the actuating carriage will be pulled clear of the rotor pivot when the caging shaft is released.

When reassembling the caging shaft (4, Figure 4.5-3) or OBS shaft(s), check that the associated pinion (27 or 30) and washers (25 and 26) are installed in the proper order.

From the rear of the shaft, first comes spacer (29), then the caging lever (45), then a metal washer (26), a nylon washer (25), pinion gear (27 or 30), then another nylon washer (25) nearest the front. Improper installation of the washers could cause undue wear on the pinion and related hardware.

NOTE

To avoid interchanging the two pinion gears (27 and 30), note that the pinion on the OBS side of the instrument has 25 teeth and the pinion on the caging side of the instrument has only 16 teeth.

4.3.5.6 Gimbal Clutch Assembly and Bearing Housing

Disassembly of the bearing housing (45, Figure 4.5-1) and clutch assembly at the top of the gimbal is not recommended unless specific replacement of component parts is required. If disassembly becomes necessary proceed as follows:

Remove two screws (46) securing the bearing housing (45) to the top of the gimbal. During disassembly, notice the order in which the bearing housing, the spring washer (48), the gimbal gear (47) and the friction shim (49) are removed. First comes the bearing housing, then the spring washer, the gimbal gear, and then the friction shim which is mounted between the gimbal gear and the gimbal. Replace any defective parts and reassemble in the same sequence.

4.3.6 Reassembly

NOTE

If a preloaded rotor housing assembly has been obtained from AIM in lieu of overhauling the rotor in the field, paragraphs 4.3.6.1 and 4.3.6.2 may be disregarded. Instead, proceed with paragraph 4.3.6.3.

4.3.6.1 Reassembly and Adjustment of Rotor Assembly (Figure 4.5-2)

1. Install the rotor bearings (5) over each end of the rotor shaft with the word "thurst" toward the center of the rotor.

2. Install the bearing retainers (4) with the recessed side toward the center of the rotor.

3. Reinstall the impellers (2 and 3) on each end of the rotor. Tighten all attaching screws securely.

4. Install the spacer (12) and preload nut (1) on each end of the rotor shaft.

4.3.6.2 Rotor Bearing Preload Adjustment and Run-in Procedure (Figure 4.5-2)

1. Set the preload nut (1) opposite the wire outlet end tight against the bearing spacer (12).

2. Carefully tighten the nut on the wire outlet end until the detectable axial end play between rotor and shaft just disappears. This rotor bearing preload adjustment is very critical and must not be exceeded if normal bearing life is to be realized.

At the correct setting the rotor shaft will spin freely in the rotor assembly and have no detectable end play. To check for proper adjustment hold the rotor stationary and spin the rotor shaft. If a noticeable roughness is apparent, the preload is set too tight or the bearings are damaged. Do not apply Glyptal to either preload nut at this time:

3. When preload has been completed, insert the rotor and rotor shaft into the rotor housing (10) and install the rotor support nuts (9).

4. Secure the rotor housing assembly on a bench or install in a suitable run-in fixture.

5. Run rotor for 48 hours with 115 vac, 400 Hz, single phase power applied to appropriate terminals on the rotor housing. Refer to the schematic of Figure 4.1-2 or 4.1-3 and use a .18- .22 mf capacitor to shift the phase applied to one winding by 90°. Recheck• the preload setting after run-in and readjust as required in paragraph (2) above.

6. Run the rotor for an additional 24 hours and check the rotor start and run-down performance. The rotor must start and continue running with 90 vac, 400 Hz applied, and run-down time should be between 6 and 10 minutes. If the rotor fails to start at 70 to 90 vac, and run-down time is not within limits, the top preload nut should be readjusted. If successive rotor starts vary more than 15 vac, the bearings are contaminated or worn and must be replaced.

7. Check that the rotor attains a speed of approximately 23,500 rpm with 115 vac, 400 Hz applied. The rotor should draw approximately 140 milliamperes starting current and approximately 115 milliamperes running current.

8. After it has been established that the rotor meets the requirements of the above paragraphs, apply a small amount of Glyptal to both preload nuts. Avoid excessive Glyptal on the free threads at each end of the rotor shaft.

4.3.6.3 Installation of Rotor Housing Assembly in Gimbal (Figure 4.5-1)

1. Install the slip ring pivot (52) on the rotor housing so that the flat side of the pivot flange is oriented as shown in Figure 4.5-1. Carefully position the rotor housing inside the gimbal by placing the slip ring into the opening in the gimbal. Install the slip ring bearing (39), shim (38), and housing (36) in the gimbal so that the bearing engages the pivot.

Install two mounting screws (37), then tighten and secure with Glyptal. Install the brush block (34) over the slip ring pivot and secure with one screw (35).

2. Place the side pivot (53) through the threaded port in the gimbal and attach to the rotor housing with three screws (54). Tighten pivot screws and secure with Glyptal.

3. Screw the threaded bearing housing (40) and bearing (39) into the gimbal until end play is barely perceptible when moderate hand pressure is exerted toward either pivot.

4. Install lock ring (41) to secure the bearing housing in place.

5. Position the rotor housing so that the flat side of the flange on the slip ring pivot (50) is toward the caging mechanism at the bottom of the gimbal. Tighten stop screw (32) fully to prevent the rotor from rolling completely over.

6. Install the erector vane so that it is an equal distance from each erector jet on the rotor housing. The ends of the erector vane must bisect the erector ports when the spin axis of the rotor is horizontal. The erector vane must not touch the erector jets at any point.

4.3.6.4 Rotor Housing Static Balancing (Figure 4.5-3)

1. Install balancing screw(s) (8) so that the screw(s) are centered horizontally.

2. Adjust the rotor support nuts (1) as required to center the rotor inside the rotor housing. When adjustment is completed, tighten both support nuts securely and apply Glyptal.

3. Turn the instrument on its side and position the rotor housing so that the rotor strut is vertical.

4. Place a small weight and a piece of tape on a gram scale and cut the tape until the total weight of the two is 3/10 gram.

5. Attach the weight to the top of the rotor housing where the two halves come together.

6. Return the rotor strut to the vertical position and let go. The rotor should not move from this position. As a further check, a screwdriver handle of similar device should be rattled along the instrument case to induce vibrations which will assist in determining any imbalance. If the rotor tends to fall, either to the top or to the bottom, appropriate weight (22) should be added at the four #2-56 tapped holes where the two halves come together.

7. Set the instrument in the upright postion with the slip ring side of the gimbal toward the back of the instrument. The rotor housing should assume about a 10° tilt to the left when viewed from the front of the instrument. Again, a screwdriver handle or similar device rattled on the instrument case, will cause the rotor housing to seek its stable position.

8. A rough adjustment may be accomplished by centering the two balancing screws and shifting the rotor inside the housing until the assemoly is approximately balanced. Final adjustment may be accomplished by positioning the two balancing screws as required. Secure the balancing screws with a minimum amount of Glyptal, since additional adjustment may be necessary during the drift and calibration tests in Section 3.

4.3.6.5 Installation of Gimbal Assembly (Figure 4.5-1)

1. Insert the slip ring pivot (42) into the bearing housing port in the bottom of the instrument case.

2. Carefully place the completed gimbal and rotor assembly into the instrument with the slip ring end centered above the lower pivot.

3. Turn the entire instrument over, being careful not to drop the gimbal or the pivot.

4. Mount the pivot to the bottom of the gimbal with two screws (44) inserted through the bearing housing port.

5. Install the bearing (13) and housing (16) with two screws (17) and secure with Glyptal.

6. Install the brush block (14) over the slip ring pivot and secure with one screw (15).

7. Return the instrument to its normal upright position and install bearing (13) and threaded housing (11) in the top of the instrument.

8. Screw the threaded bearing housing into the instrument case far enough that the gimbal will be securely held, and yet loose enough so that it will move slightly up and down when lifted and released. Install lock ring (12) and secure with Glyptal.

9. Balance the gimbal by positioning balance screws around the slots in the gimbal balance plate. Provisions have also been made for the installation of additional screws and weights in the #2-56 tapped holes on the side of the gimbal. Repeated trials will be necessary in order to achieve perfect balancing of the assembly. All balancing can be effected by adding or subtracting weight from opposing side of the assembly.

Balancing techniques vary according to shop practices. However, it is necessary to point out that trial-and-error methods are always required to obtain near perfect balancing of a precision assembly. During all stages of balancing, assemblies must be vibrated moderately to induce movement and to insure that an absolute minimum of friction between adjacent moving parts is evident.

4.3.6.6 Balancing Dial Assembly

Balance the dial assembly (21, Figure 4.5-3) by positioning weights (14, Figure 4.5-4) or adding weight (20) as required. Use a screwdriver handle or similar device rattled along the case to produce vibration which will cause the assembly to seek a stable position.

The dial ring/hub/wiper assembly (1, Figure 4.5-4) is a prebalanced assembly which should not effect the balance of the overall dial assembly. Proper balance of the dial ring can be confirmed by rotating the dial hub with respect to the front disassembly pivot (4, Figure 4.5-4). Overall balance of the dial assembly should not change.

4.3.6.7 Gear Mesh Adjustments and Bezel Installation

After the instrument is reassembled, the various points of gear mesh in the instrument must be checked and adjusted in a specific sequence before the bezel assembly can be finally installed.

1. Check gear mesh between the gimbal gear (47, Figure 4.5-1) and the intermediate gear (64, Figure 4.5-3). If required, loosen two screws (60, Figure 4.5-3) and rotate eccentric (59) to achieve optimum interaction between the two gears. Rotate the gimbal assembly fully to check for roughness or binding. When proper adjustment is achieved, tighten screws (60) securely and apply Glyptal.

2. If the dial assembly was removed for repair or replacement, reinstall in accordance with the final assembly instructions of paragraph 4.3.5.2 (5) and the following considerations.

Check gear mesh between the intermediate gear (64, Figure 4.5-3) and the crown gear (22, Figure 4.5-4) on the rear of the dial assembly. If adjustment is required, the dial assembly must be removed from the instrument and shims (22) must be added or removed at the rear of the dial assembly as required to achieve proper gear mesh. Refer to the dial assembly Repair or Replacement procedures of paragraphs 4.3.5.3.

NOTE

It is possible that a slight adjustment of the intermediate gear eccentric (57, Figure 4.5-3) may produce adequate gear mesh between the intermediate gear and both the gimbal gear and crown gear. This possibility should certainly be examined before attempting to remove the dial assembly.

3. After proper gear mesh is achieved between the crown gear and the intermediate gear, and the position of the dial assembly has been firmly established, the bezel assembly must be removed from the instrument for installation of selected spacers in front of and behind the front dial assembly bearing (19, Figure 4.5-3).

Remove the bezel assembly as described in paragraph 4.3.5.2 (1) and 4.3.5.2 (2). Reinstall bezel assembly strictly in accordance with the final installation instructions of paragraph 4.3.5.2 (5).

4. Check gear mesh between spur gear (34, Figure 4.5-3), and pinion gear (27 or 30) on both sides of the instrument. Also note gear mesh with the spur gear (21, Figure 4.5-4) when the caging shaft and OBS shaft are actuated. If required, loosen setscrew (36) on the appropriate side of the instrument and rotate eccentric shaft (35) to achieve optimum adjustment. Retighten setscrew(s) when adjustment is completed.

Also check that the collar (31) is properly positioned on each shaft (35) so that the spring (33) will force the spur gear (33) fully toward the rear when the caging shaft or OBS shaft is actuated.

4.4 GENERAL, TEST and CALIBRATION

The following test and calibration procedures may be used to either isolate malfunctions in the instrument prior to overhaul, or to checkout and recalibrate the instrument after overhaul has been accomplished. Included with each test are suggested corrective measures which should be employed if the instrument fails to meet the required performance specifications.

4.4.1 Test Equipment Required

1. 14 or 28 vdc power source, as required.
2. dc power source variable from 0-250 millivolts
3. Vacuum tube voltmeter/ohmmeter
4. 0-5 amp dc meter
5. Scorsby test stand capable of producing roll, pitch, and yaw oscillations with an amplitude of ±3 degrees about each axis at a frequency of 5 to 7 cycles per minute.
6. Stop watch
7. Clean, dust-free work area

4.4.2 OMNI Potentiometer and Meter Indicator Tests

4.4.2.1 General

The following resistance measurements and meter checks must be made with the omni converter removed from the rear of the instrument. Make indicated checks at the electrical connector on the rear of the instrument case.

CAUTION

Exercise extreme caution in connecting ohmmeter leads and power supply leads to pins on the rear connector. Inadvertently placing ohmmeter leads across a meter coil may damage the meter movement. Connect meter leads and power supply leads only as specifically instructed in the following paragraphs.

4.4.2.2 Omni Potentiometer Resistance Check

Connect ohmmeter leads across the indicated connector pins on the rear of the instrument case and check for the following resistance readings:

1. Pins 17 to 13:
   Should read 0 ohms with nose of omni pointer (2, Figure 4.5-4) set at 330°, and should increase to 3.8k as pointer is rotated 90° in either direction with respect to the dial ring.
2. Pins 17 to 14:
   Should read 0 ohms with nose of omni pointer (2, Figure 4.5-4 set at 240°, and should increase to 3.8k as pointer is rotated 90° in either direction with respect to the dial ring.
3. Pins 16 to 13:
   Should read 0 ohms with nose of omni pointer (2, Figure 4.5-4) set at 150°, and should increase to 3.8k as pointer is rotated 90° in either direction with respect to the dial ring.
4. Pins 10 to 14:
   Should read 0 ohms with nose of omni pointer (2, Figure 4.5-4) set at 60°, and should increase to 3.8k as pointer is rotated 90° in either direction with respect to the dial ring.

5. Repeat ohmmeter connections of steps 1 thru 4, and in each step set the nose of the omni pointer as required to achieve 0 ohms resistance. Observe the ohmmeter while rotating the dial assembly (21, Figure 4.5-4) through 360°. Resistance reading should not vary or fluctuate. If any of the resistance readings are erratic, check that the slip ring brushes (70, Figure 4.5-3) are properly adjusted to remain in contact with their respective slip ring grooves when the dial assembly (21) is rotated.

If the slip ring or omni pot is defective, refer to the Repair or Replacement procedure of paragraph 4.3.5.3.

4.4.2.3 Omni Indicator Meter Check

1. Set the nose of the omni pointer (2, Figure 4.5-4) toward the top of the instrument for the following check.

2. Set the 0-250 mvdc variable power supply to 0 mvdc output and connect the positive (+) lead to pin 3 and the negative (-) lead to pin 2. As the power supply output is increased gradually from 0 to 150 mv, the meter should gradually move from the zero position to right full deflection.

3. Reduce power supply output to 0 mvdc and reverse lead connections of step 2. As the power supply output is increased gradually from 0 to 150 mv, the meter should move from the zero position to left full deflection.

4. With 150 mv applied, rotate the dial assembly (21, Figure 4.5-3) through 360° to check for erratic slip ring contact. If the meter deflection is erratic, check that the slip ring brushes (70, Figure 4.5-3) are properly adjusted to remain in contact with their respective slip ring grooves.

4.4.2.4 To-From-Off Meter Check

1. Set the nose of the omni potentiometer (2, Figure 4.5-4) toward the top of the instrument.

2. With no input applied, the meter should be centered on the OFF indication.

3. Set the 0-250 mvdc variable power supply to 0 mvdc output and connect the positive (+) lead to pin 1 and the negative (-) lead to pin 6. As the power supply output is increased from 0 to 200 mv, the TO flag (the one nearest the nose of the omni pointer) should come fully into view.

4. Reduce the power supply output to 0 mvdc and reverse lead connections of step 3. As the power supply output is again increased from 0 to 200 mv, the FROM flag (the one nearest the tail of the omni pointer) should come fully into view.

5. With 200 mv applied, rotate the dial assembly (21, Figure 4.5-3) through 360° to check for erratic slip ring contact. If the meter deflection is erratic, check that the slip ring brushes (70, Figure 4.5-3) are properly adjusted to remain in contact with their respective slip ring grooves.

4.4.2.5 Glideslope Indicator Meter Check

1. Set the 0-250 mvdc variable power supply to 0 mvdc output and connect the positive (+) lead to pin 18 and the negative (-) lead to pin 19. As the power supply output is increased gradually from 0 to 150 mv, the meter should move gradually from the zero position up past the top dot approximately 1/32-inch.

2. Reduce power supply output to 0 mvdc and reverse lead connections of step 1. As the power supply output is again increased gradually from 0 to 150 mv, the meter should move gradually from the zero position down past the bottom dot approximately 1/32-inch.

4.4.2.6 Glideslope Flag Meter Check

1. Set the 0-250 mvdc variable power supply to 0 mvdc output and connect the positive (+) lead to pin 7, and the negative lead (-) to pin 8.

2. With 0 to 190 mv applied, the flag should be fully visible. As the power supply output is increased from 190 to 250 mv, the flag should move out of view.

4.4.2.7 Heading Flag Meter Check

Operation of the Heading flag meter is a function of the output from the internal 14 vdc or 28 vdc inverter, and should be checked during the rotor performance test in section 4.4.3.

4.4.3 Rotor Speed Test

This test is an "open" calibration test and should be performed with the instrument dust cover removed.

Insert a 0-5 amp dc meter in series with the 14 or 28 vdc power source. Apply power to the instrument and allow approximately five minutes for the rotor to gain speed and stabilize. Note that the Heading flag disappears from view when power is applied. The rotor should attain a speed of 22,000 rpm or greater. Check that the running current is 1.5 amperes max. for 14 vdc instruments and 0.8 amperes max. for 28 vdc instruments.

If the instrument fails to meet the above requirements, the rotor bearings are worn, or the inverter circuitry is malfunctioning. Use a voltmeter to check that the inverter is producing 115 vac, 400 Hz output with appropriate 14 vdc or 28 vdc input applied.

Rotate the instrument horizontally through 360° and check for any variation in current. Also tilt the rotor to its limits of travel and check for current variation. If current does vary, readjust tension on the appropriate brushes (15 or 34, Figure 4.5-1) so that the brushes do not drop away from their respective slip rings. The tension on each brush should be between ½ and 1½ grams.

4.4.4 Rotor Coast Test

After the conditions described in the Rotor Speed Test have been attained, disconnect electrical power from the instrument. Rotor run-down time must be five minutes or more. If the rotor fails to coast the required length of time, replacement or overhaul of the rotor assembly should be accomplished.

4.4.5 Still Run Drift and Calibration

1. Mount the instrument in a panel or secure it on a bench so that the bezel is vertical and the instrument will not change its position.

2. Apply appropriate electrical power for the remainder of this test. Allow five minutes for the rotor to attain full speed.

3. Set the indicator card on 0° or North heading and allow the gyro to run for 10 minutes. At the end of 10 minutes, the card reading must be between 356° and 4°. If the reading is not within these limits, adjust balancing screw(s) (8, Figure 4.5-2) as required to achieve proper operation.

To correct for a 10° change in drift rate, turn the balancing screw(s), 1½ to 2½ turns. To simplify calibration, the original drift and the correction made should be recorded. This procedure should be repeated and evaluated for the next correction.

4. Repeat the above procedure for headings of 90°, 180°, and 270°. Maximum permissible drift for any cardinal heading is ±4° in 10 minutes.

If the instrument fails to maintain the required performance levels, the following items should be checked for proper assembly.

a. The gear train which positions the dial assembly must be free throughout its entire range of rotation. Refer to paragraph 4.3.6.7 for adjustment procedures.

b. Check the bearings which support the rotor housing for rough spots or excessive preload. Either replace the bearings or adjust the preload as described in paragraph 4.3.6.2.

c. Check the bearings which support the gimbal for proper clearance between the gimbal and the case. The gimbal assembly must move up and down when the gimbal is lifted and released. See paragraph 4.3.6.5 for proper installation.

4.4.6 Erection Test in Still Run

Mount the instrument securely with the frame placed in a level position. Apply 14 vdc or 28 vdc electrical power as required, and allow five minutes for the rotor speed to increase and stabilize. Displace the rotor spin axis 55° from horizontal and check that the rotor automatically erects. If the rotor fails to erect, the rotor is improperly installed or the erector van (31, Figure 4.5-1) is improperly adjusted. For proper installation and adjustment, refer to paragraph 4.3.6.3.

4.4.7 Scorsby Test

Mount the instrument on a Scorsby Test stand which should be set for 5-7 oscillations per minute at an amplitude of ±3 degrees about each axis.

Apply appropriate power to the instrument and allow five minutes for the rotor to gain speed and stabilize. For each cardinal heading, the instrument drift must not exceed 4° in 10 minutes. If drift is excessive, check for possible defects and recalibrate as explained in paragraph 4.4.5. Also check freedom of the gear train as described in paragraph 4.3.6.7.

4.4.8 Caging

The rotor must be 80% to 90% caged before the spur gear (34, Figure 5.4-3) becomes sufficiently engaged to permit readjustment of the dial assembly. When the caging shaft is fully in, the rotor must be fully caged. Check that the brake (15, Figure 5.4-3) holds the dial assembly stationary when the OBS shaft is actuated and the omni pointer is repositioned.

4.4.9 Appearance

There should be no bright surfaces on the face of the dial assembly. The dial ring, glass, indicator pointers, and bezel should be free of scratches or flaking paint. The nameplate and serial number should be clearly legible.

SECTION 4.5
REPLACEMENT PARTS LIST

This section contains exploded view drawings of the DGO 10 Directional Gyro Section, showing the location of each replaceable part. Tables associated with the drawings identify each component or assembly and list the appropriate AIM part number by which replacement parts should be ordered. Inverter components are listed and identified on the appropriate schematic diagrams of Section 4-1.

List 4.5-1 Direction GYRO Section

Item No.	Description	AIM Part No.
1	Cover, dust (Gyro and OMNI Section)	614-0072-904
	Cover, Dust (Gyro Section only)	614-0095-901
2	Screw, 4-40 x ¼ in., binder hd., st. st.	——
3	Connector	821-0063-001
4	Screw, 3-56 x 3/8, binder hd., st. st.	——
5	Inverter Parts Group, 14 vdc (See Figure 4.1-1)	665-0011-905
	Inverter Parts Group, 28 vdc (See Figure 4.1-2)	665-0011-904
6	Screw, 6-32 x ¼, binder hd., st. st.	——
7	Transformer, T1 (For 14 vdc inverter) (included in item 5)	804-0028-001
	Transformer, T1 (For 28 vdc inverter) (included in item 5)	804-0026-001
8	Retainer, toroid	608-0013-001
9	Screw	603-0037-447
10	Nut	605-0038-001
11	Pivot, threaded	639-0059-001
12	Ring, lock	611-0014-002
13	Bearing	637-0004-002
14	Brush, Block	815-0002-001
15	Screw, 1-72 x ¼, binder hd., st. st.	——
16	Housing, bearing	635-0043-901
17	Screw, 2-56 x 3/16, binder hd., st. st.	——
18	Shaft actuating lever	632-0022-001
19	Lever Assembly, Actuating	656-0011-902
20	Spring, torsion	657-0004-001
21	Screw, 2-56 x 1/8, binder hd., st. st.	——
22	Shaft	632-0020-001
23	Ring, retainer	611-0026-001
24	Setscrew, Bristol, 2-56 x 3/32in., cup point	——
25	Lever, actuating	656-0009-901
26	Plate, caging	628-0018-001
27	Slide, caging	621-0004-001
28	Screw, 2-56 x 5/16, binder hd., st. st.	——
29	Spring, tension	657-0003-001
30	Terminal, lug	817-0002-001
31	Vane erector	618-0012-001
32	Setscrew, 2-56 x ¼, Bristol, cup point	——
33	Screw, 3-56 x ½, binder hd., st. st.	——
34	Brush Block	815-0002-001
35	Screw, 1-72 x ¼ binder hd., st. st.	——
36	Housing, bearing	635-0045-901
37	Screw, 2-56 x 3/16, binder hd., st. st.	——
38	Shim, as required (modify)	607-0005-001
39	Bearing	637-0004-001
40	Housing, bearing	635-0022-003
41	Ring, lock	611-0014-002
42	Pivot	639-0026-001
43	Slip Ring	826-0007-001
44	Screw, 2-56 x ¼, binder hd., st. st.	——
45	Housing, bearing	635-0033-001
46	Screw, 2-56 x 1/8, binder hd., st. st.	——
47	Gear, spur	631-0011-001
48	Washer, wavy	606-0003-001
49	Washer, friction	606-0001-001
50	Pivot	639-0025-001
51	Slip Ring	826-0007-001
52	Screw, 2-56 x 1/8, binder hd., st. st.	——
53	Pivot	639-0003-901
54	Screw, 1-72 x 1/8, flat hd., st. st.	——
55	Rotor Housing Assembly (See Figure 4.5-2)	652-0052-901
56	Case Assembly (See Figure 4.5-3)	——
57	Gimbal, machined	651-0009-901

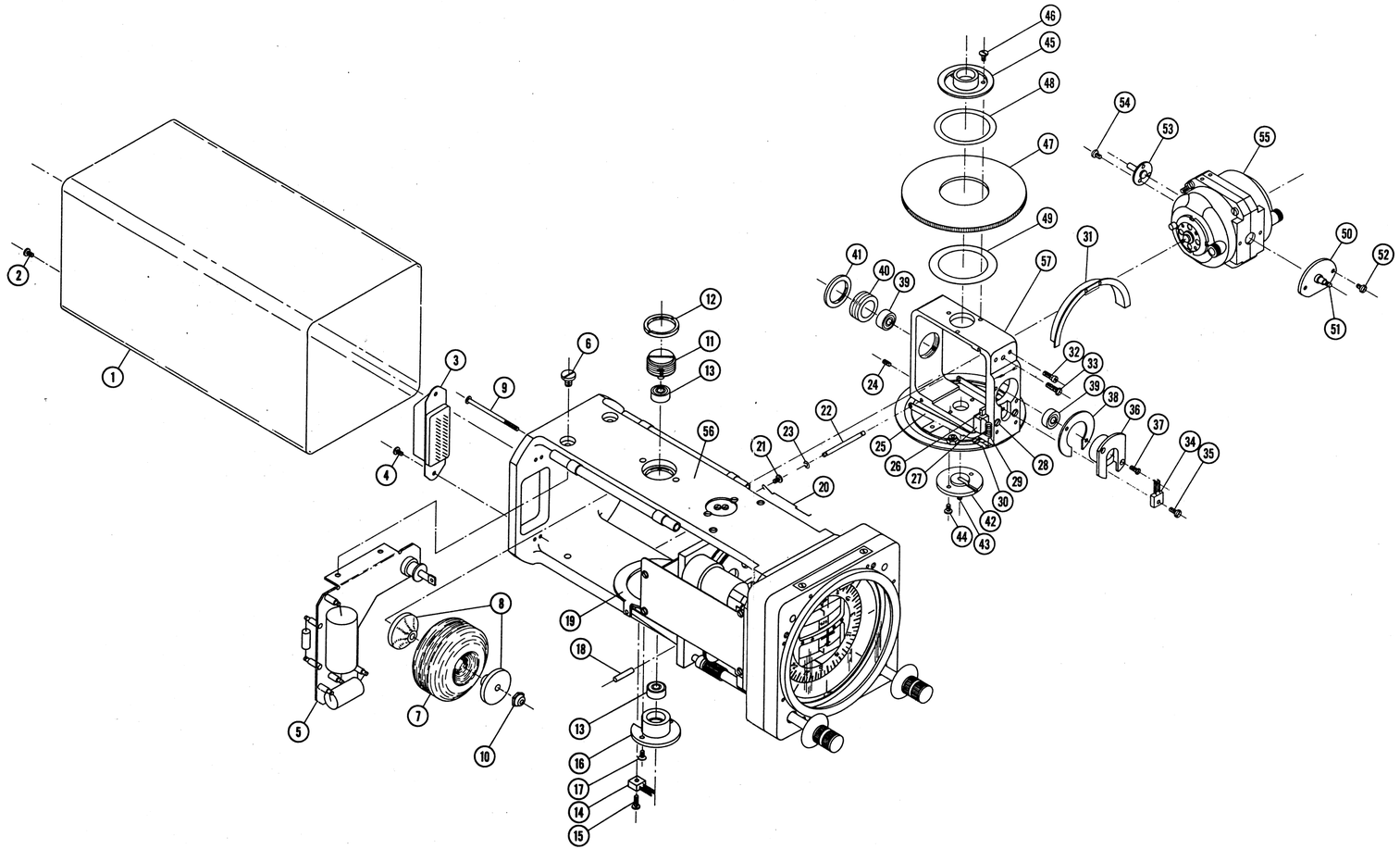


FIGURE 4.5-1 DGO 10 DIRECTIONAL GYRO SECTION

LIST 4.5-2 ROTOR HOUSING ASSEMBLY

Item No.	Description	AIM Part No.
1	Nut, preload	605-0024-001
2	Impeller, large	638-0001-001
3	Impeller, small	638-0001-002
4	Retainer, bearing	608-0010-001
5	Bearing	637-0011-002
6	Stator Assembly	827-0003-901
7	Pivot	639-0003-901
8	Screw, balance	603-0009-002
9	Nut, support	605-0010-001
10	Housing, rotor	652-0026-901
11	Housing, bearing	635-0053-901
12	Spacer, bearing	616-0018-001
13	Slip Ring	826-0007-001
14	Pivot, slip ring	639-0025-001
15	Ring Assembly	611-0020-901
16	Screw, 1-72 x ¼, fillister hd., st. st.	——
17	Screw, 3-48 x ⅜, fillister hd., st. st.	——
18	Screw, 1-72 x ⅛, flat hd., st. st.	——
19	Screw, 2-56 x ⅛, binder hd., st. st.	——
20	Bumper, ⅛ x ¼ I.D. vinyl tubing	——
21	Screw, 1-72 x 3/16 binder hd., st. st.	——
22	Weight, lead as required for balancing	——
23	Screw, 2-56, length as required, binder hd., st. st.	——

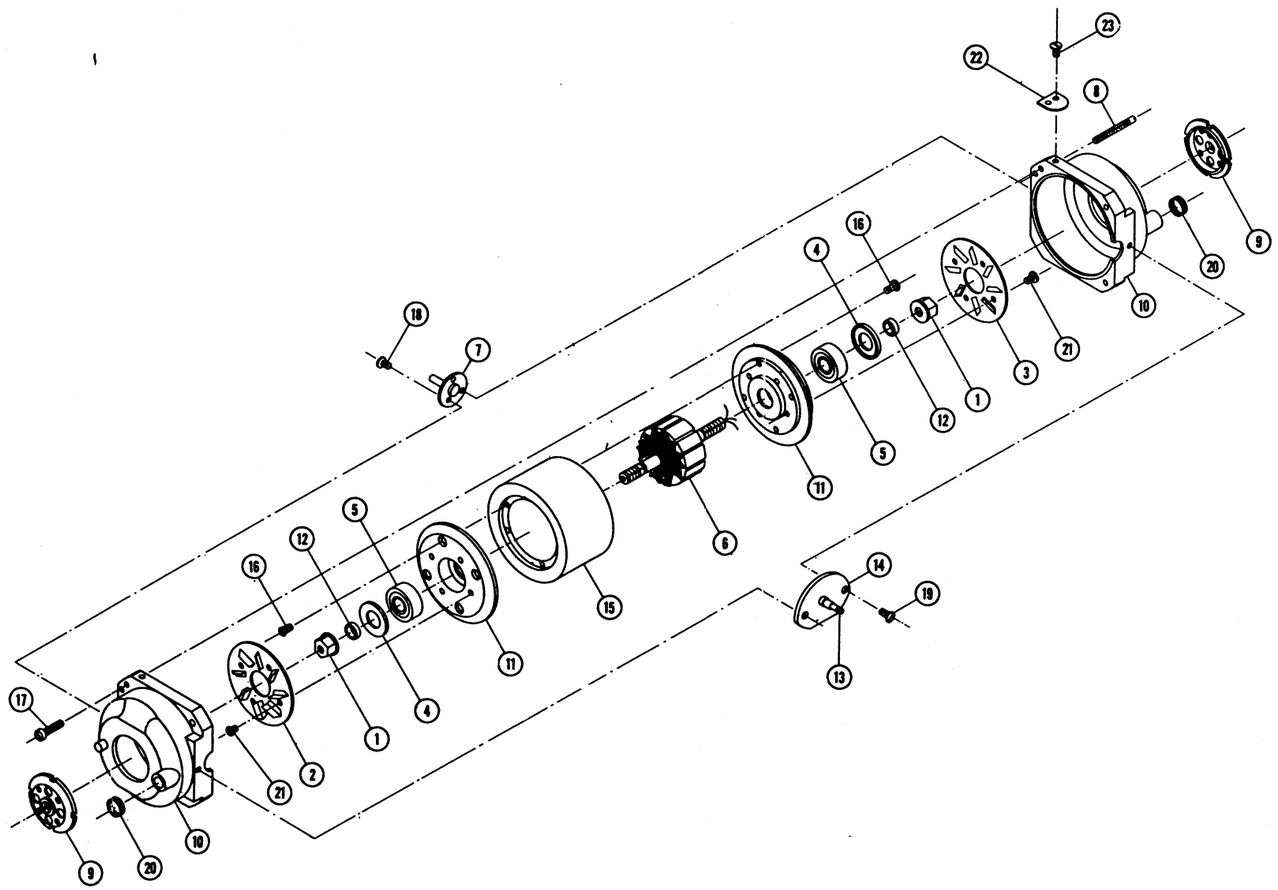
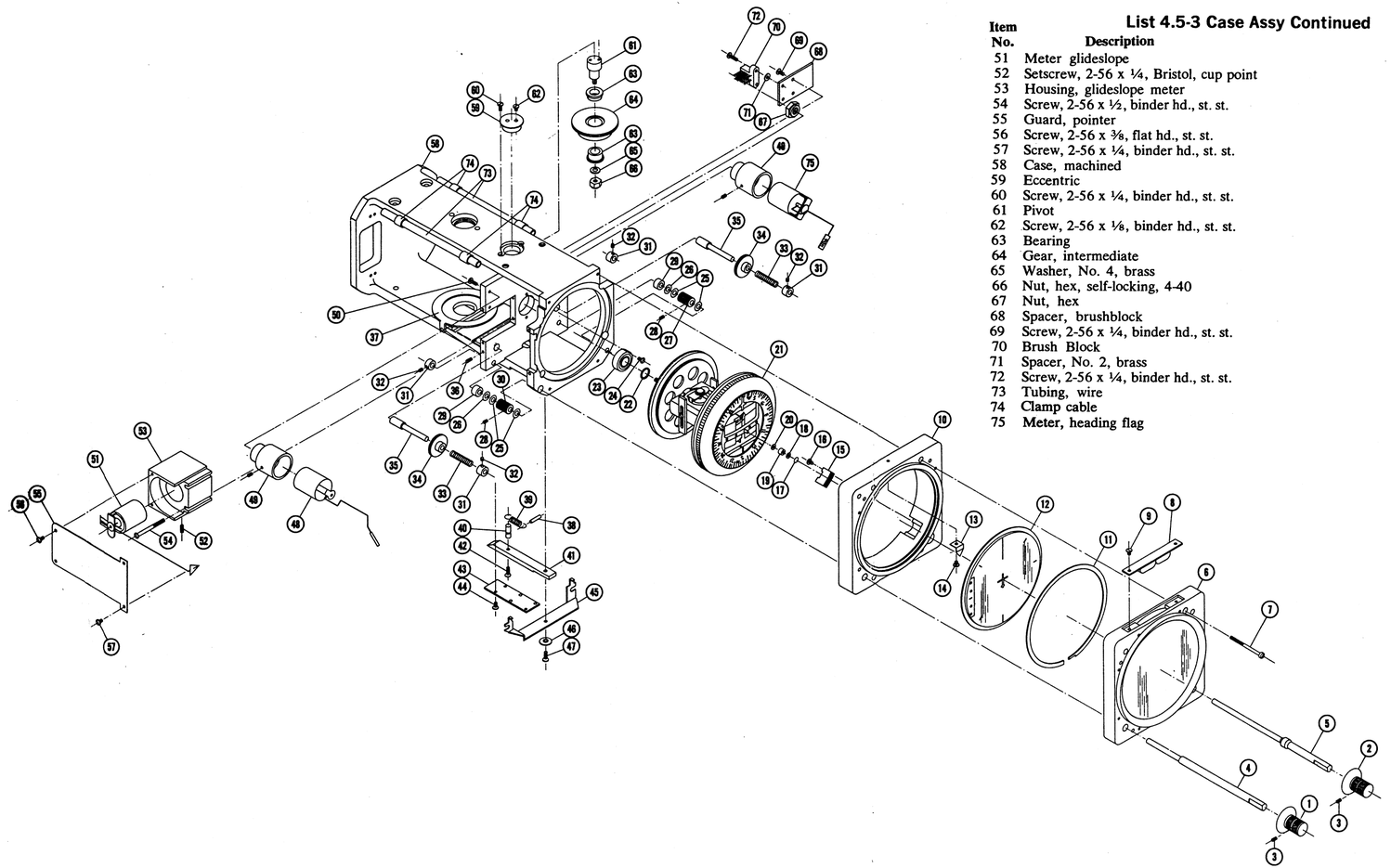


FIGURE 4.5-2 ROTOR HOUSING ASSEMBLY

List 4.5-3 Case Assy

Item No.	Description	AIM Part No.
1	Knob, caging	633-0024-902
	Label, caging knob	600-0036-001
2	Knob, O.B.S.	633-0024-903
	Label, O.B.S. knob	600-0035-001
3	Setscrew, 4-40 x 1/8, Bristol	——
4	Shaft, caging	632-0093-001
5	Shaft, O.B.S.	632-0092-001
6	Bezel Assembly, lighted, 14 vdc	653-0093-001
	Bezel Assembly, lighted, 28 vdc	653-0093-002
7	Screw, 3-48 x 1 1/8, fillister hd., st. st.	
8	14V Lamp Assy	622-0024-002
	28V Lamp Assy	622-0024-001
9	Screw, 1-72 x 3/16, flat hd., st. st.	
10	Bezel, machined	653-0084-901
11	Ring, retainer	611-0009-903
12	Glass, finished	612-0029-901
13	Indicator	648-0088-902
14	Screw, 2-56 x 1/8, binder hd., st. st.	——
15	Stop Assembly	629-0014-901
16	Screw, 1-72 x 1/8, fillister hd., st. st.	——
17	Cover, bearing	614-0073-001
18	Spacer, aluminum oxide	616-0071-001
19	Bearing	637-0038-001
20	Spacer, brass, black oxide	616-0077-901
21	Dial Assembly (See Figure 4.5-4)	650-0031-901
22	Shim, laminated (as required)	607-0012-001
23	Bearing	637-0039-001
24	Screw, 2-56 x 1/8, binder hd., st. st.	——
25	Washer, nylon	606-0007-001
26	Washer, st. st.	606-0004-001
27	Gear, pinion	631-0100-001
28	Setscrew, 2-56 x 3/32, Bristol, cup point	——
29	Spacer	616-0079-001
30	Gear, pinion	631-0015-001
31	Collar	617-0001-001
32	Setscrew, 2-56 x 1/4, Bristol, cup point	——
33	Spring	657-0005-001
34	Gear, spur	631-0097-902
35	Shaft, eccentric	632-0094-001
36	Setscrew, 4-40 x 3/32, Bristol, cup point	——
37	Lever Assembly, actuating	656-0011-902
38	Pin, Retainer	620-0003-001
39	Spring	657-0006-002
40	Post, return spring	664-0001-001
41	Slide, caging	621-0010-001
42	Screw, 2-56 x 1/4, flat hd., st. st.	——
43	Plate, caging	628-0137-901
44	Screw, 0-80 x 3/16, flat hd., st. st.	——
45	Lever, caging	656-0018-001
46	Washer, shoulder	606-0031-001
47	Screw, 2-56 x 1/8, flat hd.	——
48	Meter, glideslope flag	820-0017-001
49	Adapter, meter	641-0030-001
50	Screw, 2-56 x 5/16, binder hd., st. st.	——



List 4.5-3 Case Assy Continued

Item No.	Description	AIM Part No.
51	Meter glideslope	820-0019-001
52	Setscrew, 2-56 x 1/4, Bristol, cup point	——
53	Housing, glideslope meter	635-0087-901
54	Screw, 2-56 x 1/2, binder hd., st. st.	——
55	Guard, pointer	619-0009-001
56	Screw, 2-56 x 3/8, flat hd., st. st.	——
57	Screw, 2-56 x 1/4, binder hd., st. st.	——
58	Case, machined	649-0130-901
59	Eccentric	659-0007-001
60	Screw, 2-56 x 1/4, binder hd., st. st.	——
61	Pivot	639-0060-001
62	Screw, 2-56 x 1/8, binder hd., st. st.	——
63	Bearing	637-0033-001
64	Gear, intermediate	631-0098-001
65	Washer, No. 4, brass	——
66	Nut, hex, self-locking, 4-40	605-0038-001
67	Nut, hex	605-0031-001
68	Spacer, brushblock	616-0073-001
69	Screw, 2-56 x 1/4, binder hd., st. st.	——
70	Brush Block	815-0019-001
71	Spacer, No. 2, brass	——
72	Screw, 2-56 x 1/4, binder hd., st. st.	——
73	Tubing, wire	647-0005-002
74	Clamp cable	625-0019-001
75	Meter, heading flag	820-0016-001

FIGURE 4.5-3 CASE ASSEMBLY

List 4.5-4 Dial Assembly

Item No.	Description	AIM Part No.
1	Balanced Assembly (includes omni contact ring, dial hub, and finished dial)	634-0041-901
2	Indicator, pointer	648-0086-901
3	Indicator, tail	648-0085-901
4	Pivot, front	639-0058-901
5	Screw, 0-80 x 1/8, binder hd., st. st.	——
6	Mask, meter	645-0013-901
7	Screw, 1-72 x 3/32, flat hd., st. st.	——
8	Mask, rear	645-0016-901
9	Screw, 2-56 x 1/8, binder hd., st. st.	——
10	Meter. To-From	820-0021-901
11*	Meter Assy, OMNI (Includes meter and clamp-inseparable)	820-0033-901
12	Deleted	
13	Meter Housing Assembly (Including potentiometer, meter housing, slip ring, and resistors on the potentiometer)	635-0101-901
14	Weight, balance	626-0015-001
15	Screw, 2-56 x 1/4, binder hd., st. st.	——
16	Washer, No. 2, brass	——
17	Screw, 4-40 x 1, binder hd., st. st.	——
18	Washer, No. 4 brass	——
19	Screw, 2-56 x 1/4, binder hd., st. st.	——
20	Weight, balance, lead (as required)	——
21	Gear, caging	631-0096-001
22	Gear, crown	631-0099-001
23	Screw, 2-56 x 1/4, flat hd., st. st.	——
24	Screw, 1-72 x 1/8, binder hd., st. st.	——

*Early units had a split needle and the OMNI meter therefore could be removed from the clamp. Use current assembly (item 11) for ALL replacements.

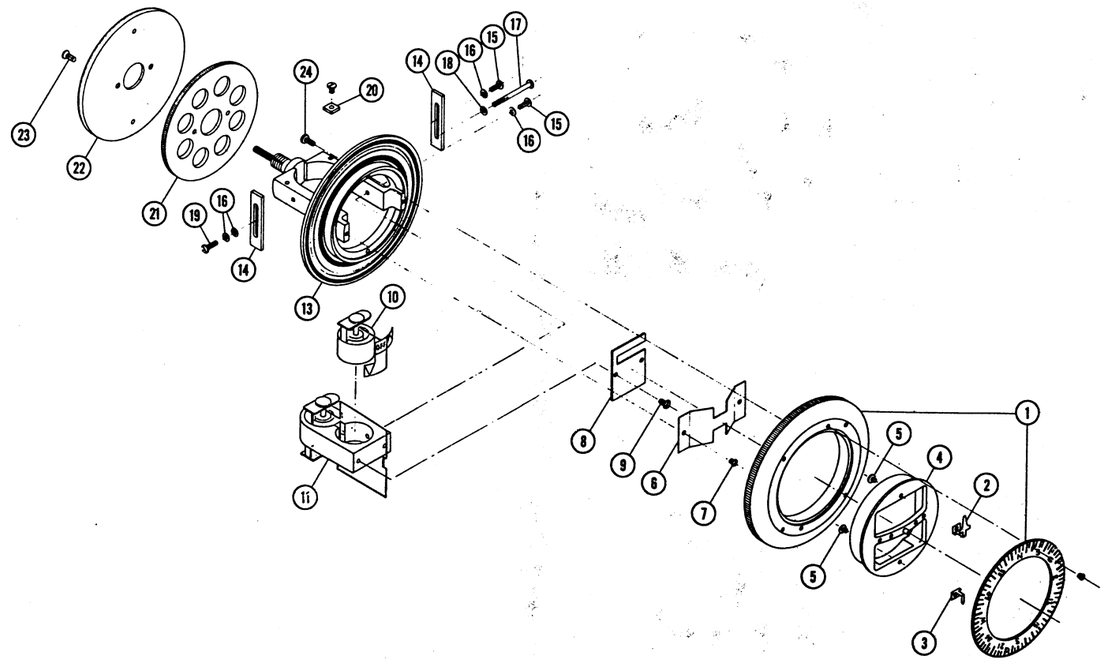


FIGURE 4.5-4 DIAL ASSEMBLY

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN DGO-9A/DGO-10 NO. 5 December 29, 1978

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO AVIONICS WHOLESALE DISTRIBUTORS

SUBJECT: ADDITIONAL SERVICE CENTERS FOR DGO-9A's/DGO-10's

Listed below are Avionics and Instrument repair facilities that are equipped to service DGO-9A's and DGO-10's.

American Avionics
6860 Perimeter Rd.
Boeing Field
Seattle, WA 98108

Cutter Aviation Inc.
P.O. Box 20306
Phoenix, Ariz. 85036

Olmsted Instruments
28 Fourth St.
Harrisburg International Aprt.
Middletown, PA 17057

W.S.M. Aero Instrument
2100 East Pleasant St.
Dekalb, Ill. 60115

Aero Systems
Miami International Airport
P.O. Box 221
Miami, FLA 33148

Duncan Avionics
Instrument Division
P.O. Box 81887
Lincoln, Nebraska 68501

Western Skyways
Portland/Troutdale Airport
Troutdale, Oregon 97060

Castleberry Instrument & Avionics
Tims Airpark
817 Dessau Road
Austin, Texas 78753

All DGO's should be sent to one of these facilities for repair rather than to Narco or Aim.

This additional list should provide you and your customer with more service flexibility and keep down time of the aircraft to a minimum.

(over)

Remember, these gyro devices may be damaged by rough handling so special care should be used in packaging and should always be shipped by air.

Very truly yours,

NARCO AVIONICS
Division of Narco Scientific

Pat Millard

Pat Millard
Manager of Technical Services

JPM/jt

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN No. DGO-9A/DGO-10 #4 October 4, 1978

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: DGO-9A/DGO-10

We have made arrangements with Castleberry Instruments and Avionics in Austin, Texas to service DGO-9A's and DGO-10's. Effective immediately all DGO's that would ordinarily be sent to NARCO factory service or AIM for repair should be sent directly to:

Castleberry Instruments & Avionics
Tims Airpark
817 Dessau Road
Austin, Texas 78753

This facility is approved for both instrument and avionics repair and consequently can service both the gyro and the converter portion of the DGO.

Sending the malfunctioning units direct to Austin will minimize time and expense for your customer. DGO's should not be sent to Fort Washington for service. We would merely send them to Castleberry, thus incurring additional shipping expense.

If the DGO to be serviced is in warranty, please supply proof of warranty to Castleberry and they will handle it under the normal warranty coverage. If the DGO is out of warranty, Castleberry will bill the sender direct.

Remember these gyro devices may be damaged by rough handling so they must always be shipped by air. Be sure to include a note giving as much information as possible regarding the observed malfunction thus expediting its repair.

Very truly yours,

NARCO AVIONICS
A Division of Narco Scientific

D. J. Tricebock
Manager of Technical Support

DJT/pk

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO SERVICE BULLETIN DGO 9A/DGO 10, No. 3 January 27, 1976

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO AVIONICS WHOLESALE DISTRIBUTORS

SUBJECT: SERVICING DGO 9A AND DGO 10

To minimize the time required to service the gyro portion of DGO 9A and DGO 10, NARCO has now made arrangements so that DGO 9A's and DGO 10's requiring service may be sent directly to AIM at Houston, Texas. It is no longer necessary for you to send the DGO's to NARCO for service.

When the gyro portion of a DGO 9A or DGO 10 requires service, you should pack it carefully in accordance with attached instructions and ship it by AIR to:

AIM, Inc.
9033 Monroe Road
Houston, TX 77017

Attn: Service Department

There is no need to send the converter. If the unit is in warranty there will be no charge for service. If it is out of warranty you will be billed by AIM for the parts and labor.

NOTE CAREFULLY

For distances over 100 miles the gyro must be shipped by AIR. Any other method of shipment will VOID the WARRANTY! For less than 100 miles UPS is the only other acceptable means of shipment. Shipment by parcel post will VOID the WARRANTY!

Note also that the gyro portion of the DGO has one or two seals. If either of those seals are broken the WARRANTY is VOID! It is important that you examine these seals as soon as you get the DGO out of the airplane. If a seal is broken show it to your customer immediately and explain that the WARRANTY is VOID. Do not send a DGO with a broken seal to AIM and ask for repairs under warranty. It will be refused.

January 26, 1976

This change in procedure should save up to one week and is another step by NARCO to improve the service provided to you and your customers.

Very truly yours,

NARCO AVIONICS
A Division of Narco Scientific Industries

Donald J. Tricebock
Manager, Customer Service & Administration

DJT/pk

Attachment

INFORMATION

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

NARCO INFORMATION BULLETIN NO. 73-06 April 2, 1973

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: DGO-10 In Warranty - Out of Warranty Repairs

Enclosed is a list of approved Warranty Stations concerning gyro repairs of the DGO-10. This list is issued in order to improve service for the DGO-10 on a worldwide basis. Warranty on the DGO-10 is one year from the date of installation or 18 months from date of manufacture, whichever occurs first.

Warranty on the gyro portion will be per AIM's policy for the gyro in question. (Aviation Instrument Manufacturing Corporation, 9033 Monroe Road, Houston, Texas 77107). This program starts April 16, 1973.

If a Narco Avionics Center determines that a DGO-10 gyro is defective, and in warranty, it should be sent to one of the approved instrument shops on the enclosed list. A Narco Warranty Claim Form should be stamped with the customer's Warranty Card and mailed to an instrument shop along with the gyro. The instrument shop will bill AIM direct for their Warranty services.

Narco's normal NAV/COM Warranty Policy for the converter section of the DGO-10 applies. Any claim from the Avionics Centers for the converter portion of the DGO-10 must be sent to Narco Avionics.

Out-of-Warranty repairs should be handled in a manner which is best for the customer. The use of radio shops, instrument repair shops, as well as factory service can be employed. Expenses to be borne by the customer. Refer to page 2-4 of the DGO-10 Maintenance Manual for harness kits which will aid in the repairs.

Very truly yours,

NARCO AVIONICS
Division of Narco Scientific Industries

D. E. Snyder

D. E. Snyder
Technical Representative

DES/pj

AVIATION INSTRUMENT MANUFACTURING CORPORATION

APPROVED WARRANTY REPAIR STATIONS

UNITED STATES

1) CONSOLIDATED INSTRUMENT CO., INC. (201) 288-1189
Teterboro Airport
Teterboro, New Jersey 07763

Odd B. Johannessen, President

2) MID-CONTINENT INSTRUMENT CO., INC. (316) MU3-5532
7620 E. Osie
P. O. Box 493
Wichita, Kansas 67201

Harry Harrington, President

3) SUTHERLANDS, INC. (206) PA3-2491
South Annex - Boeing Field
Seattle, Washington 98108

Alex McCallum, President

4) PAN WESTERN INSTRUMENT SERVICE CO. (213) 426-7205
3120 East Willow Street
Long Beach, California 90806

Bob Draper, President

5) ALASKAN AIRCRAFT EQUIPMENT SUPPLY, INC. (907) 277-1591
4707 Spenard Drive
International Airport
Anchorage, Alaska 99503

Richard B. Davey, President

6) A. I. R. CORPORATION
Oakland International Airport
Oakland, California 94614

Lars H. Lind, President

over

UNITED STATES

7) AIRCRAFT INSTRUMENTS & AVIONICS, INC. (512) 883-2877
325 44th Street
P. O. Box 5127
Corpus Christi, Texas 78405

Don Castleberry, President

8) EXECUTIVE INSTRUMENTS, INC. (214) 239-0231
771 Wiley Post Road
P. O. Box 75
Addison, Texas 75001

Wayne Holmes, Vice President

9) AERO SYSTEMS - INSTRUMENT DIVISION (305) 888-9876
Aero Facilities Hangar
Miami International Airport
Box 52
Hialeah, Florida 33011

Paul W. Stone, Executive Vice President

10) AERO-TECH, INC. (602) 294-7611
6401 South Tucson Blvd.
P. O. Box 11366
Tucson, Arizona 85706

Jim Smith, Sales Engineer

11) BARFIELD INSTRUMENT CORPORATION (305) 634-9771
4101 N. W. 29th Street
Miami, Florida 33142

Jim Barfield, President

12) A. BIEDERMAN, INC. (213) 246-8431
1045 Air Way
Glendale, California 91201

Frank A. Herle, President/General Manager

UNITED STATES

13) AIRCRAFT RADIO & ACCESSORY CO., INC. (303) 398-3717
Stapelton International Airport
Denver, Colorado 80207

David L. Wessel, Mgr. Instrument Division

14) DEL-TECH INSTRUMENTS, INC. (206) TA4-4900
19265 Des Moines Way South
Seattle, Washington 98148

L. W. Barker, Manager

15) INSTRUMENT SPECIALTIES COMPANY, INC. (817) 267-2651
1110 Stanley
P. O. Box 365
Euless, Texas 76039

Gene E. Beaty

16) SMITHS INDUSTRIES, INC. (813) 531-7781
St. Petersburg/Clearwater Airport
St. Petersburg, Florida 33732

Stanford W. Crane

17) HAMILTON INDUSTRIES (713) 644-0923
P. O. Box 12785
Houston, Texas 77017

CANADA

WRIGHT INSTRUMENT SERVICES, LTD. (416) 677-7161
2762 Slough Street
Malton, Ontario
Canada

William Wright, President

ENGLAND

1) PANDECT INSTRUMENT LAB., LTD.
Wellington Road
High Wycombe, Bucks
England

Brion Hitchcock, Director

High Wycombe 26301

2) FIELDTECH LIMITED
Heathrow Airport, London
Hounslow, Middlesex
England

C. A. H. Witts, Sales Manager

01-759-2811
(SC-12/12A RMI
Converters only)

3) C. S. E. (AIRCRAFT SERVICES) LIMITED
Oxford Airport
Kidlington, Oxford
England

Robin Montgomerie-Charrington, Director

Kidlington 4321

GERMANY

1) WDL WERFBERTRIEB
Essen-Mulheim Airport
433 Mulheim/Ruhr
West Germany

Theodor Wullenkemper, President

Mulheim/R (02133)
31009

2) LUFTFAHRTELEKTRONIK KOLN GMBH
505 Porz-Wahn
Flughafen Koln-Bonn, Halle G1
West Germany

G. Scholz, Service Manager

Porz 40 2305

GERMANY

3) LFE AVIONIC SERVICES — Hamburg 59 10 01
LUFTFAHRTELEKTRONIK HAMBURG GMBH
2 Hamburg 63 Flughafen
Hamburg, West Germany

T. W. Frendeborg, Marketing Manager

SWITZERLAND

1) TRANSAIR SA — (038) 6 37 22
Neuchatel Airport
2013 Colombier
Neuchatel, Switzerland

Phil Bujard, Avionics Manager

2) LIMESS AIRCRAFT EQUIPMENT & ENGINEERING WORKS — (051) 847033
CH-8302 Kloten
Switzerland

Bernhard von Liliencron

SWEDEN

DEHNISCH FLYGPLANINSTRUMENTVERKSTAD — 08/28 09 81
Bromma Airport
161 10 Bromma 10
Stockholm, Sweden

Richard Dehnisch

EAST AFRICA

1) KEITH CAMPLING
AVIATION CONSULTANT
Wilson Aerodrome
Box 14431
Nairobi, Kenya

Keith Campling, Director

EAST AFRICA

2) AUTAIR HELICOPTERS (AFRICA) LTD. 51299
P. O. Box 990
Lusaka
Republic of Zambia

L. R. Lord, Director

SOUTH AFRICA

PLACO LEMITED 51-3978
Rand Airport
Box 4155, Germiston South
South Africa

C. H. Oberholzer, Managing Director

AUSTRALIA

AIRBORNE ACCESSORIES (PTY) LTD. 709-1423
Building 107
Bankstown Airport
Bankstown N.S.W. 2200
Australia

Neville R. Dawes, Managing Director

BRAZIL

"OLDI" IND. COM. DE INSTRUMENTOS E. PECAS DE AVIOES LTDA. 44-8599
Av. Dr. Alberto Benedetti, 121
Santo Andre, E. S. Paulo
Brazil

Oscar Longo, General Director

ITALY

O.S.A. FILETI 5803119
Viale di Villa Pamphili, 15
Rome, Italy

Ing. V. Fileti

SERVICE

NARCO AVIONICS DIVISION OF NARCO SCIENTIFIC INDUSTRIES, Fort Washington, Pa. 19034

February 27, 1973

NARCO SERVICE BULLETIN DGO-10-2

TO: ALL NARCO AVIONICS CENTERS
ALL NARCO WHOLESALE DISTRIBUTORS

SUBJECT: DGO-10 COMPATIBILITY WITH VARIOUS NAVIGATION RECEIVERS

1. NARCO NAVIATION RECEIVERS

The DGO-10 is directly compatible with the MARK 5, MARK 10, MARK 12, MARK 12A and MARK 12B utilizing the high level omni input to the DGO-10.

The DGO-10 is directly compatible with the MARK 16, MARK 24, NAV-100, NAV-14/114, NAV-11/111, and NAV-12/112 utilizing the low level omni input to the DGO-10.

2. NAVIGATION RECEIVERS OTHER THAN NARCO (non-ARINC)

For proper operation, the DGO-10 must be presented with the NARCO phasing, and the NARCO high or low level signal amplitude.

It is the responsibility of the installing agency to determine the compatibility of this category navigation receiver.

3. NAVIGATION RECEIVERS OTHER THAN NARCO (ARINC)

The omni output of an ARINC receiver is 180° out-of-phase with NARCO, and the level is approximately 0.5 VRMS, which is slightly higher than the NARCO low level, which is approximately 0.3 VRMS.

NARCO manufactures a device, called the SA-10, which will interface the DGO-10 with an ARINC Navigation Receiver.

The SA-10, intended primarily as a device to drive an ARINC omni from a NARCO receiver, will work in reverse via the following:

PIN A - Omni signal input from ARINC receiver.
PIN B - Not used.
PIN C - 14-volt input.
PIN D - 28-volt input.
PIN E - Omni signal output to low level input of DGO-10. Monitor this Pin and adjust R-102 for approximately 0.3 VRMS. R-101 may be changed slightly if necessary. The 180° phase shift from ARINC to NARCO takes place in the SA-10 circuit.
PIN F - Ground.

A manual for the SA-10 is included with this bulletin.

Very truly yours,

NARCO AVIONICS
Division of NARCO Scientific Industries

E. V. Salzmann
Technical Representative

Enc.

NARCO AVIONICS

OMNI SIGNAL AMPLIFIER, SA-10

MAINTENANCE/INSTALLATION MANUAL

The NARCO AVIONICS Omni Signal Amplifier, SA -10, is an accessory unit which converts the NAV signal from a Mark 16, Mark 24, or a Mark 12 Series Unit to an output signal compatible in both amplitude and phase with standard ARINC navigation converters.

Provision has been made for adjusting the level of the NAV signal from a Mark 16 or 24 into the Omni Signal Amplifier by the use of R-102. This resistor is adjusted for an output level of .5v ±10% from the Omni Signal Amplifier (Pin E of J-101)) when a 30 Hz 30% modulated RF carrier and 1000 microvolt signal is fed into the Mark 16 or 24.

This adjustment is not necessary for a Mark 12 Series since the levels coming out of a Mark 12 Series are constant.

Connections are made via the seven (7) pin connector on the SA-10. Refer to Figure 1, Omni Signal Amplifier for pin connections.

The Unit is designed to be mounted with standard hardware. See Figure 2 for mounting dimensions.

This Replacement Parts List provides identification of the components of this unit.

OMNI SIGNAL AMPLIFIER, SA-10

Symbol	NARCO Part No.	Description
	56570-1	MOUNTING, Plate
	56571-1	COVER, Plate
	04384-1	LABEL, Nameplate
	81442-1	STRIP, Tie lug, 6 hole
	81290-3	NUT, "U"
C-101	21555-11	CAPACITOR, Tantalum, 39 mf ±10%, 10v
C-102	21554-3	CAPACITOR, Electrolytic, 200 mf, 15v
CR-101	75025-3	DIODE, Zener, 11v
J-101	41166-4	CONNECTOR, Miniature
P-101	41166-5	CONNECTOR, Miniature
Q-101, Q-102	75584-1	TRANSISTOR, Silicon, 2N2712
R-101, R-106, R-108, R-109	31192-472	RESISTOR, Carbon, 4.7K ±10%, ¼ w
R-102	32045-3	RESISTOR, Variable
R-103	31192-184	RESISTOR, Carbon, 180K ±10%, ¼ w
R-104	31192-103	RESISTOR, Carbon, 10K ±10%, ¼ w
R-105	31195-753	RESISTOR, Carbon, 75K ±5%, ¼ w
R-107	31192-102	RESISTOR, Carbon, 1.0K ±10%, ¼ w
R-110	31192-471	RESISTOR, Carbon, 470 ohm ±10%, ¼ w

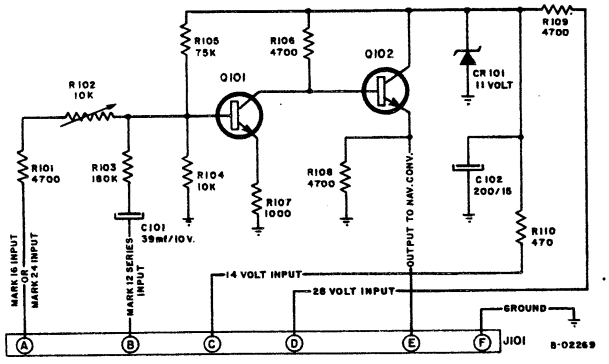
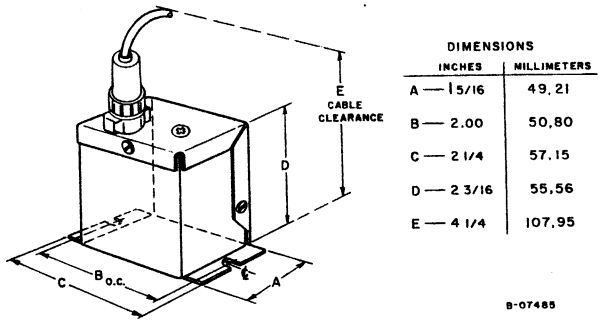


Figure 1. OMNI SIGNAL AMPLIFIER



DIMENSIONS		
	INCHES	MILLIMETERS
A	1 5/16	49.21
B	2.00	50.80
C	2 1/4	57.15
D	2 3/16	55.56
E	4 1/4	107.95

Figure 2. SA-10 INSTALLATION DRAWING

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3706-600

GYRO SECTION

Please make the following changes to the GYRO Section of your maintenance manual.

1. Section 4.1.4 SPECIFICATIONS, page 4-3
   Change Operating Limits to:
   Azimuth, 360°
   Pitch and Roll; 80° freedom through controlled precession, self-erecting, non-tumbling.

2. Section 4.1.4 SPECIFICATIONS, page 4-3
   Change Drift as follows:
   Maximum of 4° in 10 minutes . . .

3. Refer to Fig. 4.1-2, page 4-3:
   R3 changed to allow better cold temperature start.
   R3 was 2.7K ohm, ½w . . . then 1500 ohm, ½w . .
   NOW 1500 ohm, 1.5w
   Adjust schematic and parts list thereon to reflect this latest change.

4. Refer to Fig. 4.5-3, page 4-23:
   Item 10 has been modified to put OBS brake on the case. The new part (653-0107-104) IS interchangeable with the earlier part (653-0084-901). Adjust the parts list to reflect this change.

How are we doing?

We at Narco welcome your comments and suggestions about the manuals, both good and bad. These are the best indicators of how informative the manual is to you, the ultimate user.

Should you have a helpful addition or find something that appears to be an error — fill in this slip and mail it right to the Technical Pubs Dept. and upon evaluation, we'll adjust the manual to include it.

All actions must include the following:

Manual Name .....

Manual No. ..... — ..... Supplement No. ..... (if any)

Page No. ....

From _____

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